INDUSTRIAL REFRIGERATION

August, 1958

Vol. 135 No. 2

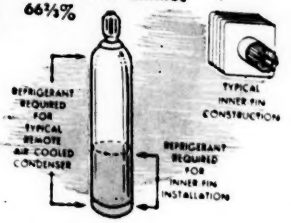
Page 9

Page 12

Page 26

What's NEW in Remote Air Cooled Condensers? *This*

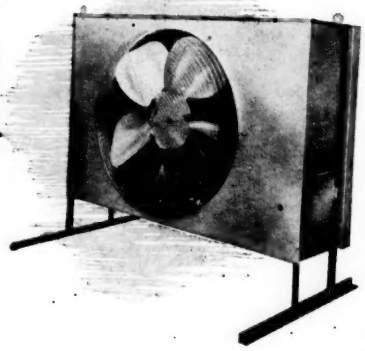
A REMOTE AIR COOLED CONDENSER THAT REQUIRES ONLY 1/3 OF THE REFRIGERANT CHARGE USED BY COMPETITIVE MODELS


AVERAGE SAVING ON REFRIGERANT CHARGE 66⅔%
REFRIGERANT REQUIRED FOR TYPICAL REMOTE AIR COOLED CONDENSER
TYPICAL INNER FIN CONSTRUCTION
REFRIGERANT REQUIRED FOR INNER FIN INSTALLATION

A RECENT 300 TON JOB SHOWED SAVINGS OF 1800 LBS. OF REFRIGERANT THROUGH USE OF THESE UNITS.

Yes, the Dunham-Bush 'BC' Remote Air Cooled Condensers with famous Inner-Fin construction mean savings of 67% in refrigerant charge. Additionally, they mean smaller receivers and minimum loss if the system charge is lost. In these expertly planned units, the exclusive Inner-Fin construction diminishes the internal volume of the coil while increasing the heat transfer coefficient. And higher heat transfer factors permit design of more compact units, saving valuable space in installation.

AS MUCH AS 53.5 TON CAPACITY IN ONE UNIT



The Dunham-Bush line of 'BC' Remote Air Cooled Condensers includes models in 13 sizes with capacities ranging from 2.2 tons to 53.5 tons, making possible use of a single unit for practically any job !

FOR ALL 'ROUND PROTECTION

Plastic vinyl paint is applied to all ferrous parts of unit casing and structure in three stages:

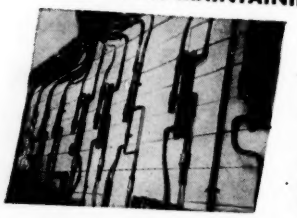
PRIMER—a polyvinyl plastic combined with zinc chromate.

INTERMEDIATE—a vinyl resin with high lead content.

FINISH—hard grey, all weather resistant plastic vinyl.

All interior surfaces of the unit casing are given an extra finish coat of plastic vinyl.

AND FOR MAINTAINING SATISFACTORY HEAD PRESSURES



at all ambients, Dunham-Bush engineers offer the 'PS' Pressure Stabilizer.

'PS' units can be mounted indoors near the compressor, facilitating the making of necessary adjustments. They are thoroughly factory tested and assembled, and require connection only to the refrigerant liquid and discharge lines. No extra piping or special loops required. Regulating valve gives smooth pressure control and eliminates wide pressure fluctuations inherent in other head control systems.

The name Dunham-Bush is synonymous with efficient, satisfactory service for all types of pressure and temperature conditions. For technical assistance, our engineering staff is at your service. For more information, contact us.

Dunham-Bush, Inc.

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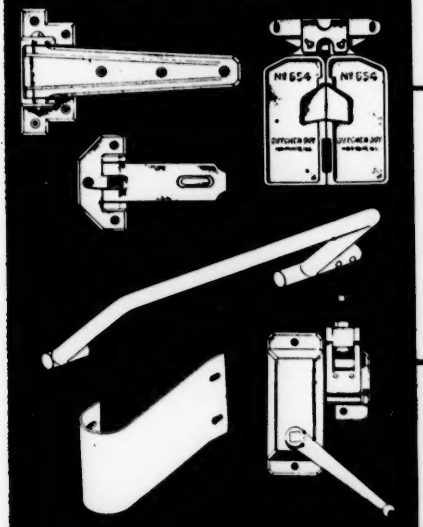
BRUNNER CORPORATION (CANADA) LTD. PORT HOPE, ONTARIO

"Butcher Boy" Since 1885

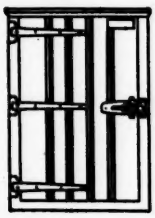
Refrigerator Doors

REFRIGERATOR DOOR
HARDWARE



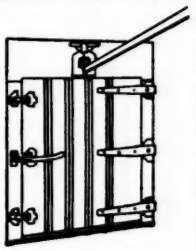
SAFETY RELEASE FASTENERS
No 11 or No 12
Permit opening from within even though padlocked from outside

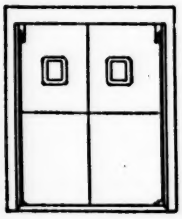
CATALOGS AVAILABLE UPON REQUEST



STANDARD COOLER-FREEZER DOORS

- Modern Streamlined Appearance
- 100% Douglas Fir Construction
- Massive and Durable Hardware



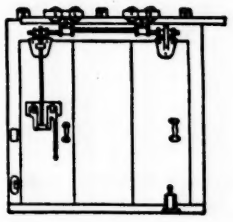


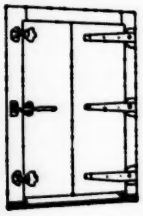
STANDARD VESTIBULE AND AUTO CLOSE DOORS

- Double Acting Doors for Loading Docks
- For Heavy Trucking Openings
- Save Refrigeration Losses

HORIZONTAL SLIDING DOORS

- Ideal where space factor is limited
- Recommended for Freezer Areas
- Available for manual, air, or electric operation
- Mechanically operated doors open and close in less than 4 seconds





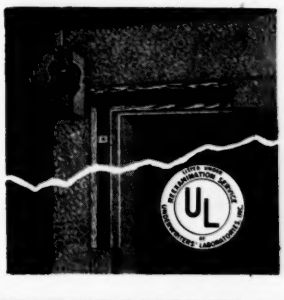
LOW TEMPERATURE INFITTING AND SUPER FREEZER OVERLAP DOORS

- Low Temperature Doors for +10 to —20° F
- Super Freezer Doors for —0 to —100° F
- Both types available with No. 51 electric defrosters
- Extra heavy duty hardware applications

New!

FULLY AUTOMATIC ELECTRIC DEFROSTERS

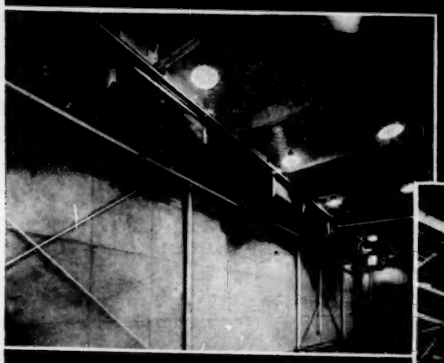
- Underwriter's Approved—An exclusive First with Butcher Boy
- Flexible "silicon" covered (not lead covered) heater cables
- Furnished with calibrated "thermostat"—economical heat control



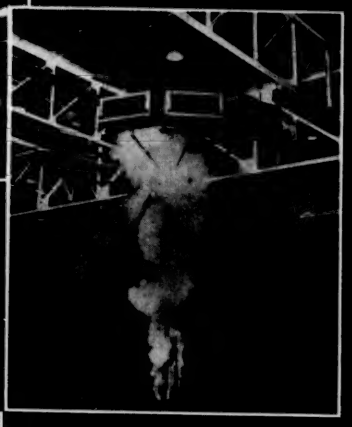
BUTCHER BOY REFRIGERATOR DOOR CO. Dept. "MG" HARVARD, ILLINOIS

BE SURE — SPECIFY

RECOLD

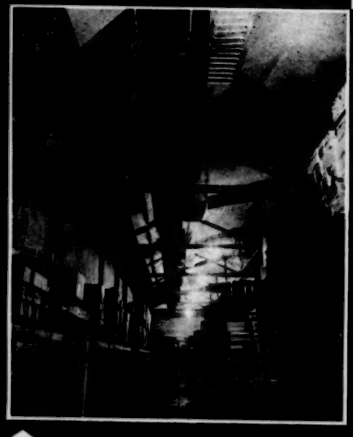


Ralphs Grocery Frozen Food Warehouse
Los Angeles, California



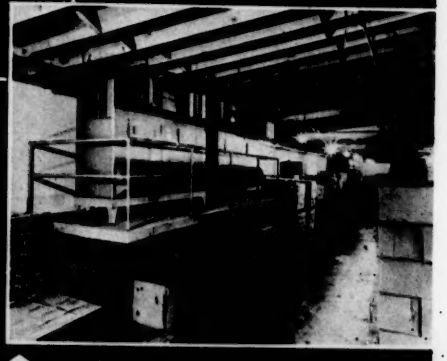
Alford's Refrigerated Warehouse
Dallas, Texas

Burbank Refrigerating Company
Burbank, California



United Frozen Food Warehouse
Los Angeles, California

Ridge Citrus Concentrate Warehouse
Davenport, Florida



Certified Grocers Frozen Food Warehouse
Los Angeles, California

RECOLD

CORPORATION

7250 East Slauson Avenue, Los Angeles 22, California

August, 1958

Number 2

Vol. 135

Industrial Refrigeration

Now in its 67th Year of Publication

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Contents

Refrigeration Heats Laboratory 9
Further confirming predictions made at the American Power Conferences in March '57 and '58, and at the Edison Electric Institute's 1958 sales conference, the new Sylvania–Amherst Engineering Laboratory is another plant to be equipped with a heat pump installation.

Cold Evaporation For Drying Milk 12
Industrially, refrigeration is being used in other than the heat pump application as a replacement of boilers. Previously used in the concentration of citrus, the low temperature system of evaporation is also successfully applied in milk drying.

Model Hospital Engineering Course 14
Baptist Memorial Hospital in Memphis has a practical engineering program. Complex in operation and with 40 percent of its total cost invested in engineering, this hospital administration has recognized the need for such training and set up a model course for graduate as well as operating personnel.

U. S. Dairies–Domestic and International 16
Dairy organizations in the United States have teamed up with Divisions of USDA to move surplus commodities, and to sell Americanism. Domestically, the industry grows taller and broader.

Raleigh Warehouse Officially Opens 18
Planned for construction in four steps, the Southeastern Bonded Refrigerated Warehouse nears construction of the second section. The firm emphasizes specialized service to producers in order to compete with private warehousing.

Refrigeration's Role in Missiles 26
Little does the American public realize the extensive part played by refrigeration in the missile program. As a part of air conditioning, it regulates the temperature of the "Stable Table" area from which the missile is navigated. Although not a system in itself, a refrigeration application is involved in the fuel storage aboard. Again, on the ground in the air conditioning role and in connection with the preparation of fuels, refrigeration plays a prominent part.

Departments

What's New	4	Manufacturer's News	32
News Briefs	7	Industry Meetings	33
Question Box	20	NAPRE Official	36
TRRF	31	Chapter News	38

The Cover:

▶▶▶ Having the appearance of four very special industrial type buildings, the evaporative condensers pictured are those used in the alternate roles of condenser or outside air coolers in the heat pump installation at the new Sylvania Laboratory near Buffalo. Units are located atop the engine room building, and are grouped in pairs to serve the twin compound air-source heat pump systems.

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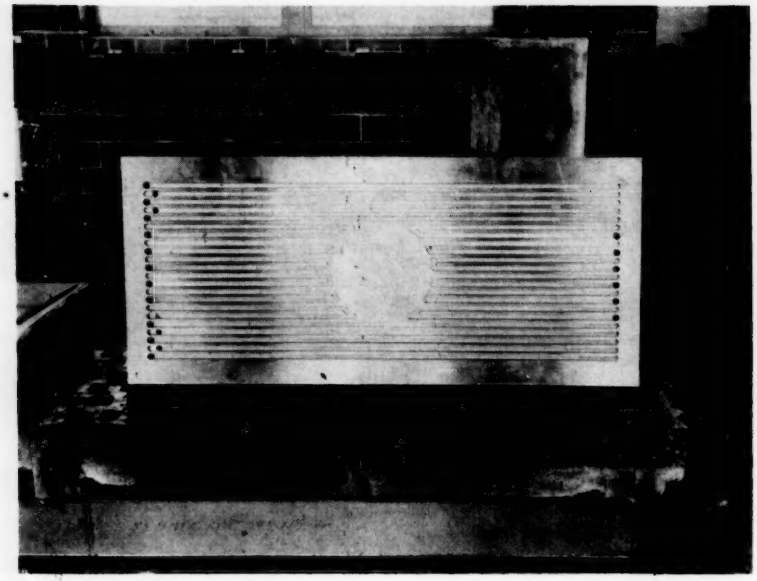
What's New

MACHINERY
APPLIANCES • PROCESSES

Plate With Built-in Coils

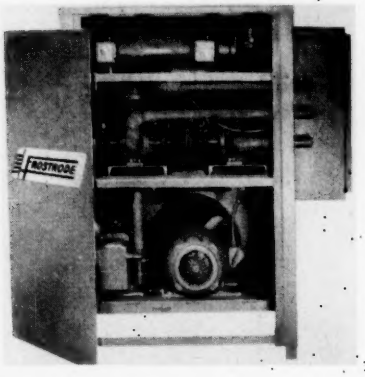


▸▸ OPPORTUNITIES for using heavy composite plate as a heat transfer medium have emerged as the result of Chicago Bridge & Iron's method of vacuum cladding known as Horton clad. The heavy base plate (generally of steel) is channeled before the alloy or non-ferrous cladding layer is applied, to form coil-like passageways for a cooling or heating medium in the very heart of the finished clad plate—and at a selected distance from either surface.

Horton clad has already been applied for precise surface temperature control in the venturi sections of hypersonic wind tunnels. In reactors and vessels it has provided internal heating and cooling of critical partitions. In refrigeration, greatest interest seems to center about easier cooling of heavy plates in high-pressure structures, and producing heat exchange surfaces of new metals and alloys. Both thoughts open new design frontiers in refrigerated equipment.

Channeling for the cooling fluid may follow almost any pattern, and layouts for large plates are often divided into independent coil-like sublayouts such as the channeled steel plate pictured (a 21 x 48 x 1¼-in. hypersonic wind tunnel section, before applying the cladding). Note 22 inlet and outlet taps, so that cooling fluid is circulated in 11 parallel loops for low pressure drop, high flow and temperature-distribution control.

Dual Cooling Unit



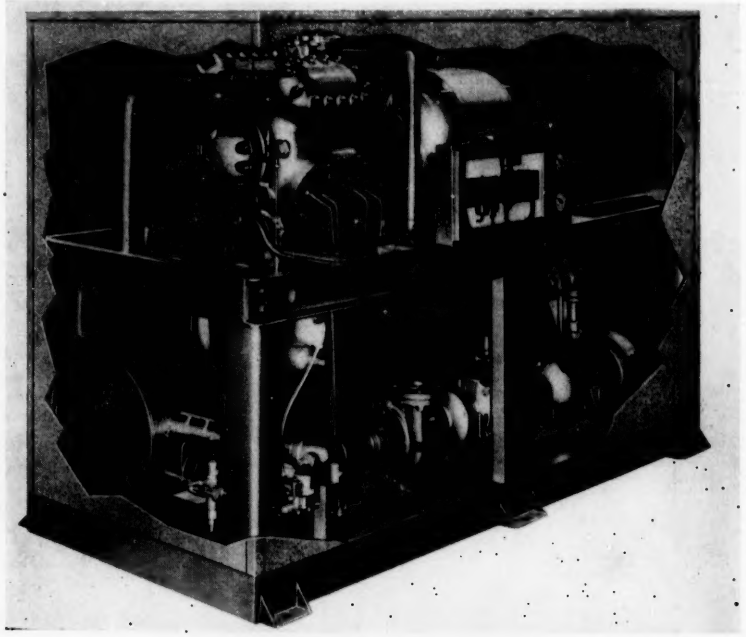
▸▸ COOLANTS, hydraulic fluids or gear lubricants for machine tool operation are more efficiently cooled by mechanical refrigeration. New dual units manufactured by a Pontiac, Michigan firm are designed to handle any two coolant jobs.

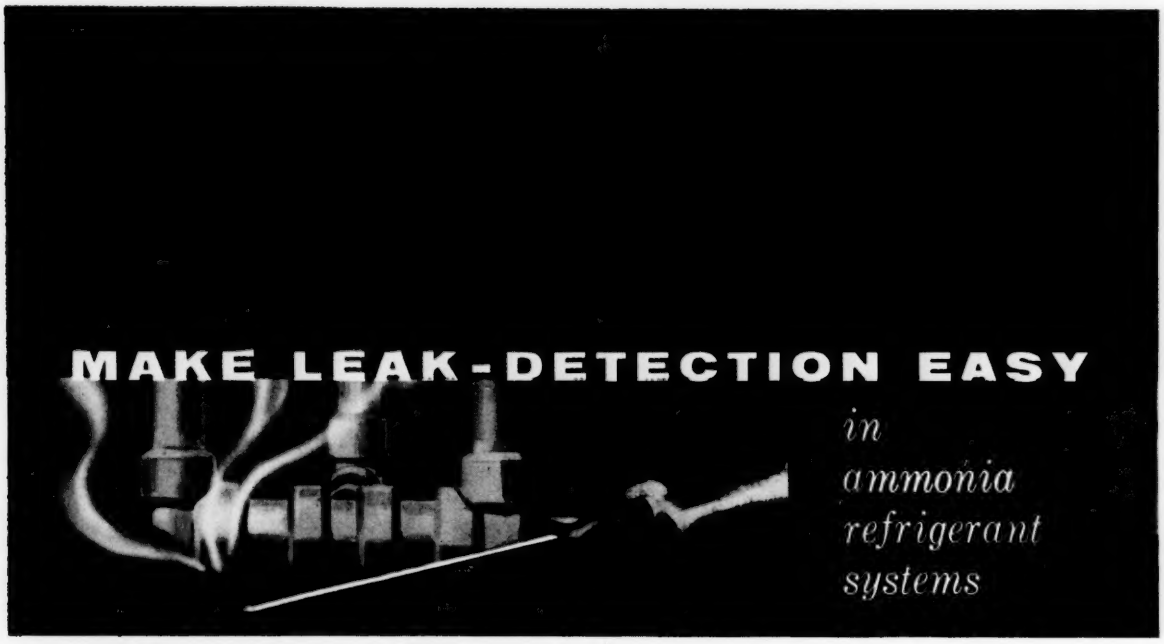
One high efficiency refrigeration unit handles the entire job. Separate controls for each cooling circuit permit accurate independent regulation. Savings effected by the dual function is estimated at about one-third of first cost and half of required floor area.

Package Liquid Coolers

▸▸ CLAIMING another industry first, Bell & Gossett Company has recently introduced a newly designed package liquid cooler. All major components are designed, built and guaranteed by the manufacturer. Sizes are available in the range of 7½ to 150 tons.

The Morton Grove, Illinois manufacturer's liquid chiller is unique in that it is planned whole rather than an assembly of purchased parts. Manufacturer lists as additional features to its responsibility for all major components, such items as low center of gravity and easy accessibility.





...Just contact your local distributor of Barrett® Brand Anhydrous Ammonia, listed below. He'll be happy to supply you with handy "Sulfstix" Ammonia Leak Detectors. And you can count on him for prompt, courteous service on Barrett Brand Ammonia – the purest, *driest* refrigeration grade ammonia you can buy!

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New York: E. M. Sergeant Pulp & Chemical Co. 7 Dey St.
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Rochester: Wm. B. Duffy Carting Co., 62 Scio St.

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Cincinnati: Merchants Chemical Co., Inc. 2933 Spring Grove Ave.
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Okla. City: Rex Engineering & Sales Co., 2735 N.W. 10th St. P. O. Box 5141
Tulsa: Vaughn Chemical Co. 1102 E. 3rd St.

PENNSYLVANIA
Altoona: Western Pennsylvania Chem. Co., Inc., 4125-41 6th Ave. P. O. Box 703
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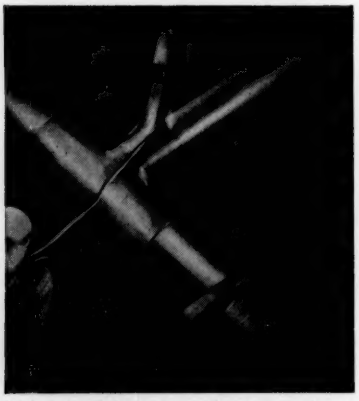
The closed-cell structure of Armaflex seals out air and moisture, prevents dangerous condensation.

Stop harmful condensation at temperatures down to 0° F. with Armstrong Armaflex



Self-extinguishing Armaflex is completely safe to install before sweat fittings are made. Armaflex is clamped back from fitting, then connection is made.

With the new ¾" thick Armstrong Armaflex Pipe Covering, condensation can be stopped on fluid lines operating as low as 0° F. Armaflex is a highly efficient, flexible insulation with a k-factor of 0.28 at 75° F. mean temperature. Its closed-cell composition needs no separate vapor barrier, effectively seals out air and moisture. At all temperatures from 0° to 200° F., you can specify the economical amount* of Armaflex because it comes in a complete range of nominal wall thicknesses—⅜", ½", and the new ¾".

Faster, more economical jobs result from use of Armaflex. This insulation can cut labor costs by as much as 50%, compared with application costs for conventional, old-fashioned pipe coverings. Armaflex can be slipped over piping before connections are made or slit and snapped on. Joints are sealed with Armstrong 520 Adhesive. Fittings are easily insulated with miter-cut pieces of Armaflex.

* **Recommended Armaflex thicknesses** for various service conditions are listed in a free, descriptive booklet. For your copy, write to Armstrong Cork Company, 2208 Skye Drive, Lancaster, Pennsylvania.

Armstrong INSULATIONS

news briefs of the month

Univ. of Calif. Has Magnetic Sub-Freezer

Electro-magnetic refrigerating to nearly absolute temperatures can now be accomplished for experimental work at the Berkeley campus of the Univ. of Calif. First major piece of operating equipment in a new laboratory of Dr. Wm. F. Giaque, Professor of Chemistry and Noble Laureate, the magnetic refrigerating principle employed in the device is based on a discovery of Dr. Giaque. Matter heats up when magnetized, and therefore should cool down when de-magnetized.

Two more magnetics of the same type are planned. Univ. of Calif. funds expended for the construction of the magnetic device, which is no bigger than a suitcase, were in excess of a million dollars. Office of Naval Research, National Science Foundation and AEC provided another million for equipment and installation. Power required for operation of the supercooling instrument is in excess of that required to drive a submarine.

Thermo-Electric Refrigeration

Westinghouse Electric Co. announced in July that they had achieved a major break-through in thermo-electric refrigeration research. Materials for electrical junctions which produce selected amounts of cold almost instantaneously, had been the bottle neck in this development of recent years. New techniques and materials, according to Westinghouse releases, promise to take this electric refrigeration out of the laboratory. Such practical developments as a baby bottle heater-cooler, mobile warmer-cooler hostess cart, and refrigerated mixing bowl demonstrated the application.

New Refrigeration Plant For Pillsbury Mills

Construction of a new two million dollar refrigerated food plant is underway at New Albany, Indiana, for Pillsbury Mills, Inc. The 275,000 sq. ft. building, located on a 35 acre tract, will employ about 300 persons. Pillsbury expects to move its refrigerated foods plant and research equipment into the new facilities in 1959. The firm also has a frozen food plant under construction at East Greenville, Indiana.

Two More Research Plants For Food A-Preserving

Large scale experiments underway in July on radiation preserving of foods, is expected to be one of the important activities at the new AEC Savannah River plant, Aiken, South Carolina. Objectives of the AEC irradiation experiments is indefinite preservation of certain foods, particularly toward helping backward countries where refrigeration problems now rule out large scale famine aid.

The plan calls for food supplied by the Army to be exposed to gamma rays given off by used fuel from atomic reactors. In March, the Army announced plans for a food irradiation center at Lathrop, California; completion by 1960. The Fresno, Calif. Laboratory of the Agricultural Marketing Service Biological Science Branch, USDA, will be responsible for originating shipments to be tested at the center.

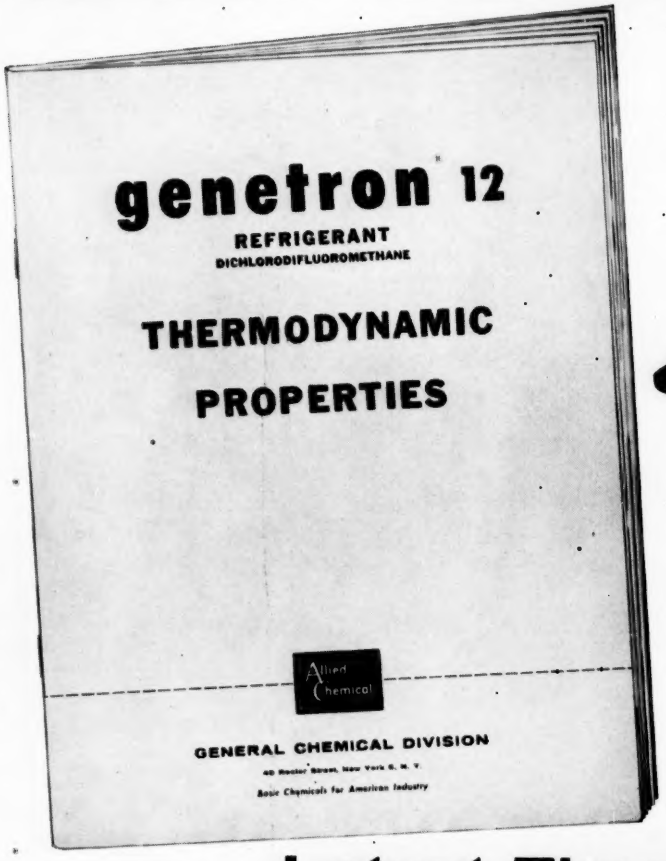
Maintenance Investment

Mounting importance of maintenance function in manufacturing industries is emphasized by the fact that companies now have invested nearly $64,000 in plant and equipment for each maintenance worker. So reported, L. C. Morrow, General Chairman, Plant Maintenance and Engineering Conference, in July. The Conference was held in Chicago last January.

Room for Improvement In Refrigeration

Graduates trained in air conditioning and refrigeration were told at commencement exercises that there is still room for improvement in this field. The speaker was Dan D. Wile, Vice-president and Chief Engineer, Recold Corporation. He was speaking at the California State Polytechnic College exercises. Cal-Poly, one of the few colleges offering a Bachelor of Science degree with a major in air conditioning and refrigeration, has been training students for the industry since 1935. Dean of Engineering is Professor Harold P. Hayes, conductor of the NAPRE Question Box.

NEW! *from General Chemical research...*



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REFRIGERATION HEATS LAB

▶▶▶NEW ERAS of industrial air conditioning and fuel conservation were ushered into New York state on May 8 when the Sylvania Electric Products Company dedicated its Amherst Engineering Laboratory at Buffalo. Doing advanced electronic development work for all of the Armed Services, the Sylvania laboratory is heated and cooled by a compound compression air source heat pump developed by York Corporation, subsidiary of Borg-Warner. Located in Amherst, a suburb of Buffalo, the new laboratory is said to be the nation's most modern facility for the development of advanced electronic equipment produced by Sylvania's Electronic System Division. Sylvania is engaged in such fields as passive defense, communications, guided missiles, radar, and computers.

Not only the first installation of its kind in New York State, the Amherst plant is said to be the northernmost building ever to be heated by an air source heat pump requiring no supplementary heating of any kind. Using no conventional fossil fuels, but only the electricity needed to run the equipment, the system extracts heat from the outside air, even in below zero weather.

Boosters For Boilers

Heat removed from outside air is raised to a usable temperature level by two-stage refrigeration compression. This heat is used to produce hot water which is circulated to air conditioning apparatus throughout the building. The same refrigeration equipment that cools the building during the hot summer months will therefore heat the 85,000-square-foot, two-and-one-half story structure (see Fig. 1) during Buffalo's frigid winter weather.

Although no estimates can be released until the system is in use through one heating season, previous compound compression heat pump jobs sold by this refrigeration manufacturer in the past two years are reporting operational savings up to 20 percent over combined conventional compression-refrigeration cooling and fuel-fired heating systems.

Heat pump system for Sylvania's laboratory is located in a specially designed engine room adjacent to the main building (see Fig. 2). This compound compression plant has a capacity of 250 TR for summer cooling and 2,400,000 Btu/hr for winter heating. The system consists of two identical Refrigerant-22 systems, each

Fig. 1—View from the rear of Sylvania's engine room building shows security glass panels. Two of the four evaporative condensers-outside air coolers are visible atop the engine room roof.

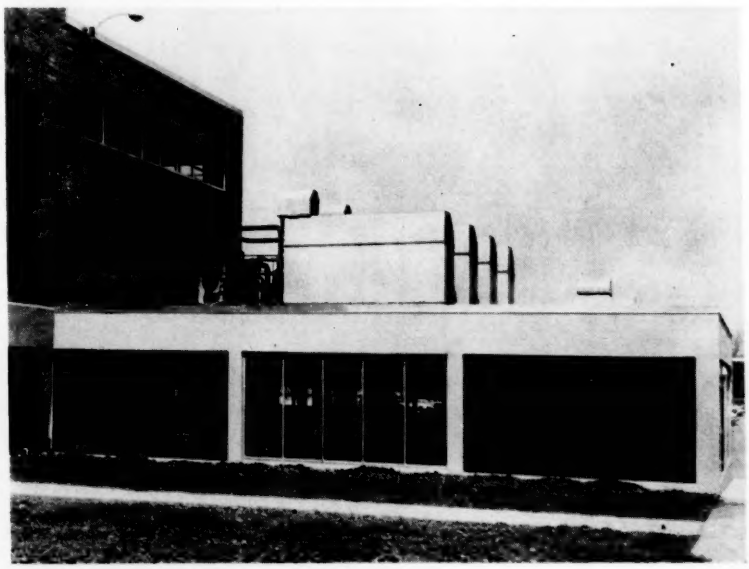


Fig. 2—Street view of the engine room building at Sylvania's Amherst Engineering Laboratory. Green tile squares form decorative panels at either side of the plate glass windows through which the engine room interior can be seen day or night.

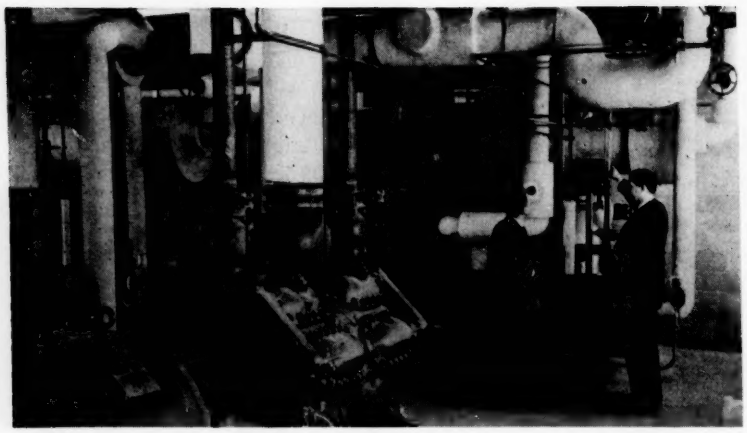


Fig. 3—Air source heat pump system at Sylvania's new Amherst Engineering Laboratory is enclosed in a 40 x 40 ft. engine room. Geo. Briley, York Branch Manager, makes a point regarding cooler-heater with Harry Pearl, Sylvania Plant Engineer.

Fig. 4—At right angles from the camera position in Fig. 3, are four compressors making up the complete heat pump system. All of the compressors are 16 cylinder machines; high stage compressors are 125 hp, the low stage 75 hp.

Fig. 5—Electric control center is at the left, while the heat pump supervisory data center and control panel is at right. In center foreground is one of the 125 hp compressors.

made up of one 125-hp high-stage 16-cyl. 1170 rpm V/W compressor, one 75 hp low-stage 16 cyl 1750 rpm V/W compressor, (Figs. 3, 4, 5) two air cooler-condensers, and one 22-in diam. x 12 ft water-cooler-heater. Hot or cold water is circulated to the air conditioning units by a 20-hp pump.

There are 96 fan coil air conditioning units around the building perimeter (Figs. 6 & 7). Interior areas are air conditioned by a zoned low pressure air system distributing through various types of ceiling diffusers (shown in Figs. 8 & 9). Special areas are conditioned with a local recirculation system. Return air in these units is mixed with conditioned air to regulate temperature conditions in a given area with a load varying from zero to 100 percent.

Four (two in each system) air units on the roof of the engine room (see again Cover, and Figs. 1 & 2) are utilized as air coolers in winter and evaporative condensers in summer. The single water cooler-heater in each system switches automatically from cooling in summer to heating in winter.

Central Control and Finger-Tip Supervision

The entire heat pump system is automatically controlled by a data center and control system (Fig. 10), which actuates pneumatic systems to switch from heating to cooling or vice versa, depending upon outside air temperature and interior building requirements. At the touch of a button, a temperature indicating device on the central control panel instantaneously registers temperature levels in various parts of the building. The panel also features an electronic recording temperature controller which records the outside air temperature and the temperature of water returning to the cooler-heater. The controller regulates the water temperature by varying compressor capacity or number of compressors on the line.

Fan systems for the laboratory are located in a penthouse atop the roof (see Fig. 11). Air handled is approximately 65,000 cfm. Inside summer design is 78 F dry bulb and 50 percent RH at outside conditions of 93 F dry bulb and 75 F wet bulb; in winter, operation is at 70 F. dry bulb with outside design conditions of minus 5 F dry bulb.

Architect and engineer for the new Sylvania laboratory building was J. Fruchtbaum of Buffalo, and the John W. Cowper Co., Inc. of Buffalo was general contractor.

Fig 6—Decorative polished aluminum panel conceals one of 96 fan coil air conditioning units.

Fig. 7—Window exposures in the laboratory cafeteria are conditioned by a pair of fan coil units. Water piping to each unit is located in the raceway between them, branching from the concealed risers in the building structure between windows.

Operating Advantages of The Industrial Heat Pump

1—Electrical energy costs have continued on a flat curve as compared with fuel cost curves. Therefore operating costs are likely to remain constant.

2—In addition to first cost savings between boiler and refrigerating plants, the additional space gained can be an extra revenue earning asset.

3—No air polution problem.

4—Better traffic planning.

5—Elimination of the costlier boiler water treatment.

6—Hazard reductions improves insurance rates.

7—Electrically driven heat pumps are not subject to possibility of unanticipated fuel deliveries. Energy reaches plant by wire.

Fig. 8—Air conditioning of cafeteria, other than exposed areas, is accomplished by 3 multi-directional ceiling outlets along this wall.

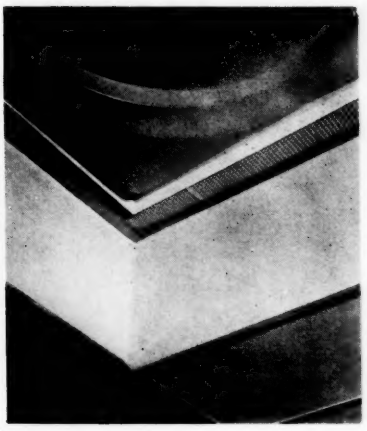


Fig. 9—Decorative grille around the periphery of the colorful lobby at Sylvania's Amherst Engineering Laboratory, is return air intake.

Fig. 10—Amherst Laboratory Manager, right, makes a point as Briley presses button for a temperature indication.

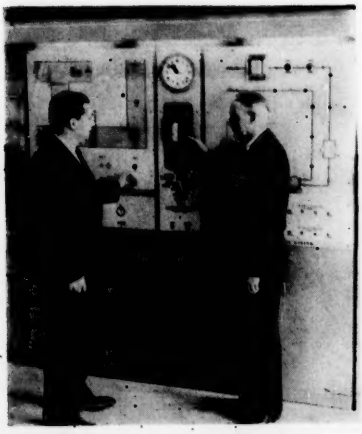
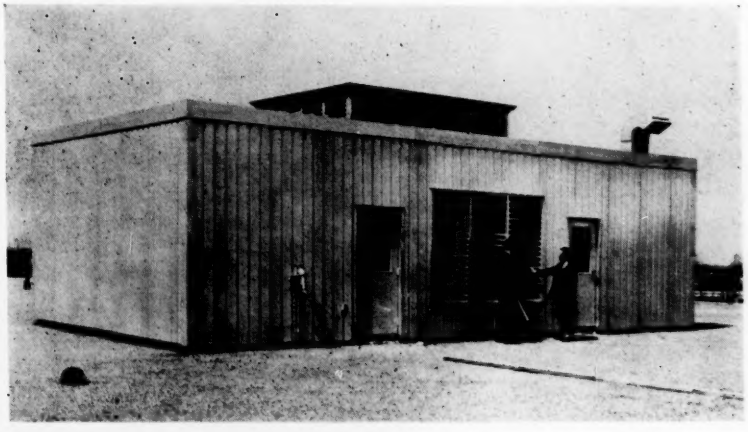
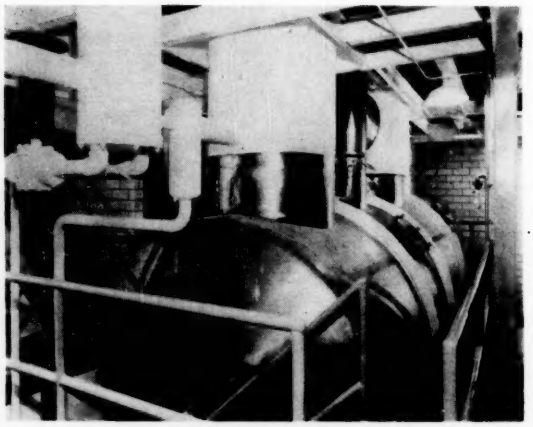


Fig. 11—Air conditioning penthouse on the roof of the Amherst Engineering Laboratory contains fans for air distribution system. These fans have a total capacity of 65,000 cfm. Louvre atop penthouse is for outside air admittance.

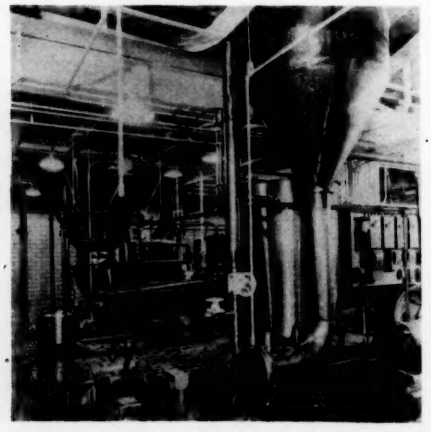


Cold Evaporation For Drying Milk

Tops of the Lo-Temp evaporators first (left) and second effects. Platform is four levels above working floor.



First and second effects of the evaporator are headed into the vapor chamber, which is the large horizontal cylinder vessel pictured. Milk is evaporated in the first effect at 92 F by NH_3 vapor; in the second at 74 F by H_2O vapor from the product.



Beneath the vapor chamber are located the concentrate pumps. Pictured here is the volute pump which serves the second effect.

Heat Pump Vaporizes, Condenses Water

▶▶▶PREMIUM quality dry milk is produced economically, without steam and its customary boiler facilitates and high temperature evaporative equipment. Des Moines Cooperative Dairy is one of the more recent installations of the Lo-Temp (heat pump) Evaporator systems developed, manufactured and installed by Mojonnier Bros. Co., Chicago, for citrus concentrating, pharmaceutical processing and dry milk producing. With this new dual-effect (vacuum-refrigeration) application, the Des Moines Coop is now capable of processing 750,000-lbs of fluid milk per day during peak periods.

Growing Pains

Progress in any enterprise brings improvement and expansion. With Des Moines Cooperative improvements meant alterations, and growth meant expansion and additions. These posed real problems, and the plans of the Coop to produce more dry milk from surplus fluid produced by its membership meant adding to an inadequate double effect steam evaporator and milk dryer.

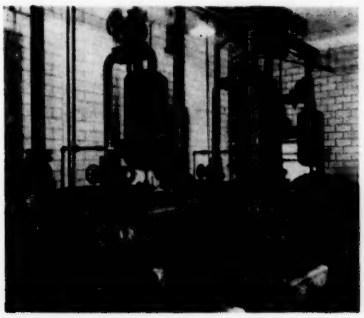
To meet an accelerated production program with a second steam evaporator would have been impractical. The plant lacked not only the additional boiler capacity required, but more important, the dairy did not have the necessary water supply. As in many communities today, it would not only have been difficult to secure the necessary amount of water, plus the added cost of other steam condensing requirements, but disposing of the water after it had been used would have involved additional taxation to the operational budget.

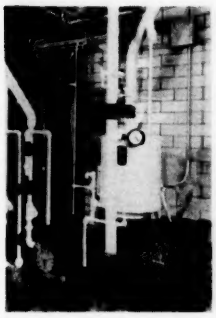
Compressors for Boilers

Executives for the Des Moines Cooperative selected what was to be an economically operated evaporation unit which required a negligible amount of condensing water, no steam, and hence no boiler. A Lo-Temp Evaporator was teamed up with a new Spray Dryer, the entire system being almost semi-automatic. It operates on a refrigeration cycle which evaporates water from milk at a temperature of 92 F, and features push button operation in addition to cleaned-in-place convenience.

The system is designed to concentrate 16,500 lbs of skim milk to approximately 40 percent total solids, by evaporating some 13,000 lbs of water per hour. The concentrate is then pumped to the dryer which evaporates an additional 2,000 lbs of water, leaving 1500 lbs of three percent moisture content dried milk.

Much in the same manner that the air conditioning industry has learned from the refrigeration engineer the simplicity of multiple compression heat pumps, Mojonnier engineers have been showing chemical manufactur-





Heart of the "cold evaporator" is the three each combination of Vilter multi-cylinder compressors and vacuum pumps (right).

ing and food processing industries the unique but simple process of heat pump evaporation. Ammonia vapor at 115 F is introduced into the first effect at relatively high pressure. Milk flows down through a tube nest which is surrounded by the ammonia vapor and water is evaporated from the milk at a temperature over 90 F but always less than 100 F. In the Des Moines operation the first effect is 42-in OD by 20 ft. chamber with 200 2-in stainless steel tubes. Vacuum pumps reduce the pressure within the effects, permitting the evaporation at lower temperature.

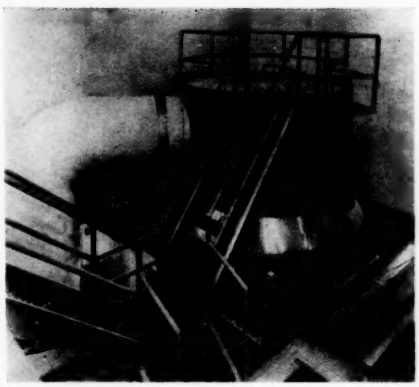
Water vapor which formed in the first effect is used in the second stage of the evaporator in much the same manner the ammonia was used in the first stage. Milk flows through the same type stainless steel tube nest. Only this time, the water vapor from the first effect, located in the shell, evaporizes water from the milk in the tubes but a temperature lower than before. The temperature of this second stage evaporation is about 75 F.

NH_3 Heat Vaporizes H_2O in One Effect Then Condenses That From Both Effects

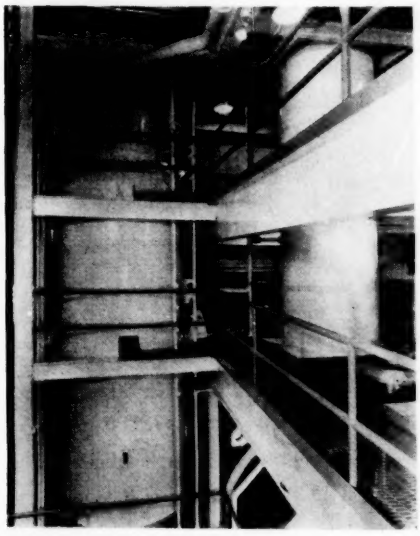
Ammonia vapor introduced to the first stage, of course, was condensed to liquid when its latent heat was given over to the milk. It is drained off of that stage to the receiver. The water vaporized from the milk in the second stage is now introduced to the condenser where it comes in contact with a high concentration of one-inch mild steel tubes containing ammonia liquid at approximately 70 F. This liquid refrigerant supply from the receiver condenses the water vapor which is discharged from the system. However, the ammonia itself is vaporized at a low pressure and is drawn away by the compressors which convert it to high pressure and return it to the initial step of the cycle. Three 100 hp Vilter multi-cylinder compressors are used in the Des Moines installation.

The Co-operative Story

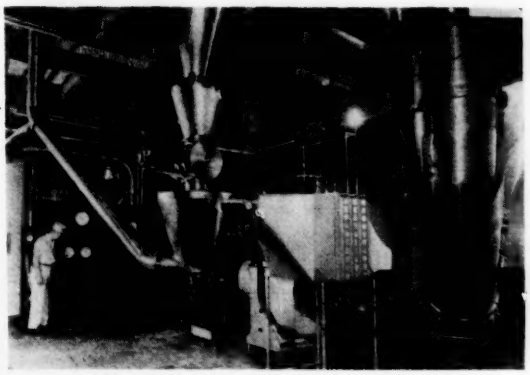
Initially the Des Moines Cooperative Dairy was organized as a marketing association. That was 37 years ago. First processing equipment was installed in 1926. Since that time Des Moines Coop has been handling more and more milk, receiving surplus milk supplies from adjacent milk sheds of Ames, Marshalltown, Cedar Rapids and Manning, as well as surplus milk from feeder plants 120 miles away. Membership has jumped 150 percent in the last ten years to a total of 1200 Grade A producers, according to Roy Nelson, Coop's general manager. Richard Johansen is the plant manager and B. O. Ridgeway is field man for the Coop.



Pictured is the top of the huge Spray Dryer. Concentrate enters at high pressure through the small line at right and is dried immediately by heat introduced through the large circular duct, left.



Water vapor from the evaporator process is condensed in vertical vessel at left. At right is the second effect chamber.



View of the working floor from beneath the Spray Dryer. Control board contains recorder-controller which regulates the process.

Hospital Refrig
Air Cond
Engineerin

By
CHARLES A. CONLEY

▶▶▶ BAPTIST Memorial Hospital, Memphis, features a resident training program in hospital engineering. Through courtesy of Daniel M. Roop, professional engineer, who is administrative engineer of the hospital, Tennessee Chapter No. 1, made a tour of the institution and observed the training program in operation. Assisted by Frank B. Duncan, Refrigeration Supervisor, D. M. Roop explained not only the training functions of his engineering department, but went into detail in connection with the refrigerating plants employed by the hospital in maintaining health and comfort conditions as well as preserving food and pharmaceuticals.

Each member in attendance received a fine 16-page booklet which describes the hospital engineering training program, which was initiated in July 1956. The purpose of the prescribed course is to offer training in Engineering and Administrative techniques relative to the field of Hospital Engineering, and its relationship to patient care.

Typical coil induction unit for patient rooms Madison-East building.

The program is designed to meet the needs of the graduate engineer as well as those of the practical mechanic who is interested in learning the detailed, as well as broad aspects of engineering, plant operation, maintenance, and business administration of today's modern hospitals.

The periods of training may vary with the individual desires of the registrant. The minimum suggested time for completion of the entire program is 26 weeks. The scheduled program is divided between actual field practice and theory.

Refrigeration Program

Refrigeration and Air Conditioning is the second subject scheduled for the first 12-week session and consist of two weeks of instruction and work in this department. It involves:

- Inspection of Plant Equipment
- Basic refrigeration theory and practice
- Expansion valves
- Evaporators
- Compressors
- Condensers
- Flow equipment
- Controls (electric, pneumatic & manual)
- Operating and servicing
- Insulations
- Air Conditioning theory
- Air distribution and requirements
- Water for air conditioning
- Operation of central plant equipment
- Preventive maintenance
- Safety

In his preface to the subject course catalog D. M. Roop comments as follows: "Hospitals of today, both new and old, have become a complex operation with numerous devices, equipment and machinery requiring constant vigilance.

"The new hospital, with an investment approximately 40% of its total cost, in electrical, mechanical, and plumbing facilities, commands protection of this investment. The remaining invested costs, represented by the building and medical equipment, also deserve adequate consideration.

"Management cannot economically and morally justify such capital expenditures unless it is willing to protect them by establishing an organization with personnel trained in the hospital's Engineering, Administrative, and Mechanical functions necessary for their preservation.

"It is with these fundamentals in mind, and the nationally recognized need for trained personnel in the vocation of Hospital Engineering and Maintenance, that this program has been promulgated."

Refrigeration Applications

Baptist Memorial Hospital in Memphis is one of the most modern and up-to-date in the country. It covers 1,250,000 sq. ft. of floor space. The very finest equipment is used in its 19 operating rooms. There, in the operating room is the most critical area in the entire hospital's air conditioning system. Refrigeration assures optimum temperature and humidity conditions for the patient and tolerable working atmospheres for the surgeons. For these reasons, as well as anesthesia control, large tonnages of air conditioning is concentrated in operating and obstetrics.

However, the tonnage for the operating rooms, important as it is, is small by comparison with the 2400 aggregate TR of the whole plant. Six centrifugal-condenser-chiller units are used to refrigerate a central

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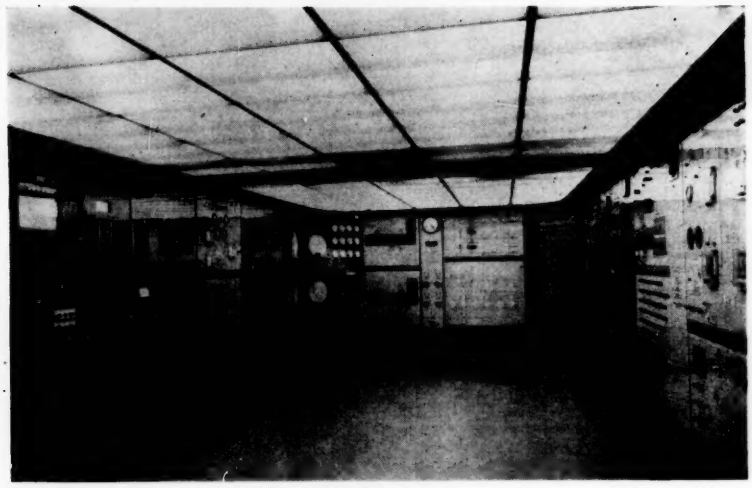
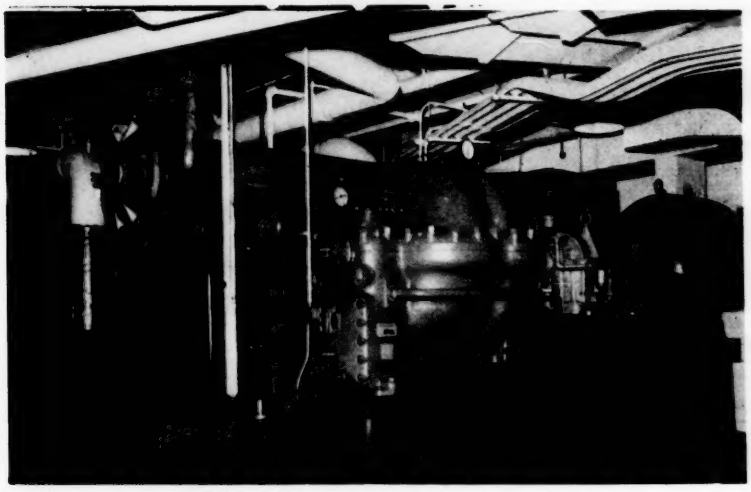
Observed By NAPRE



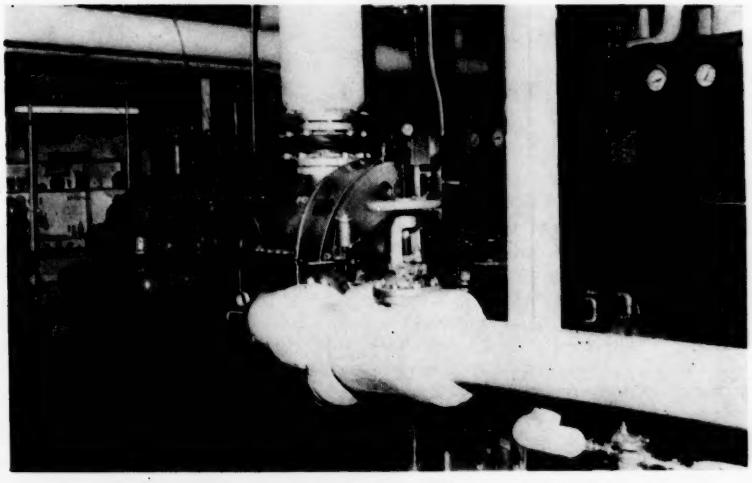


One of two motor driven centrifugal compressors serving an increment of the Baptist Memorial Hospital. Developed TR is 367 tons with a 300 hp drive.

sweet water circulating system for temperature and humidity control. A number of smaller units are used for keeping adequate temperatures in refrigerated boxes in many kitchens and the cafeteria. There are also independent units for maintaining temperatures in the blood banks. Domestic units, too numerous to mention, are used in the various floor pantries, plus perishable drug stations.

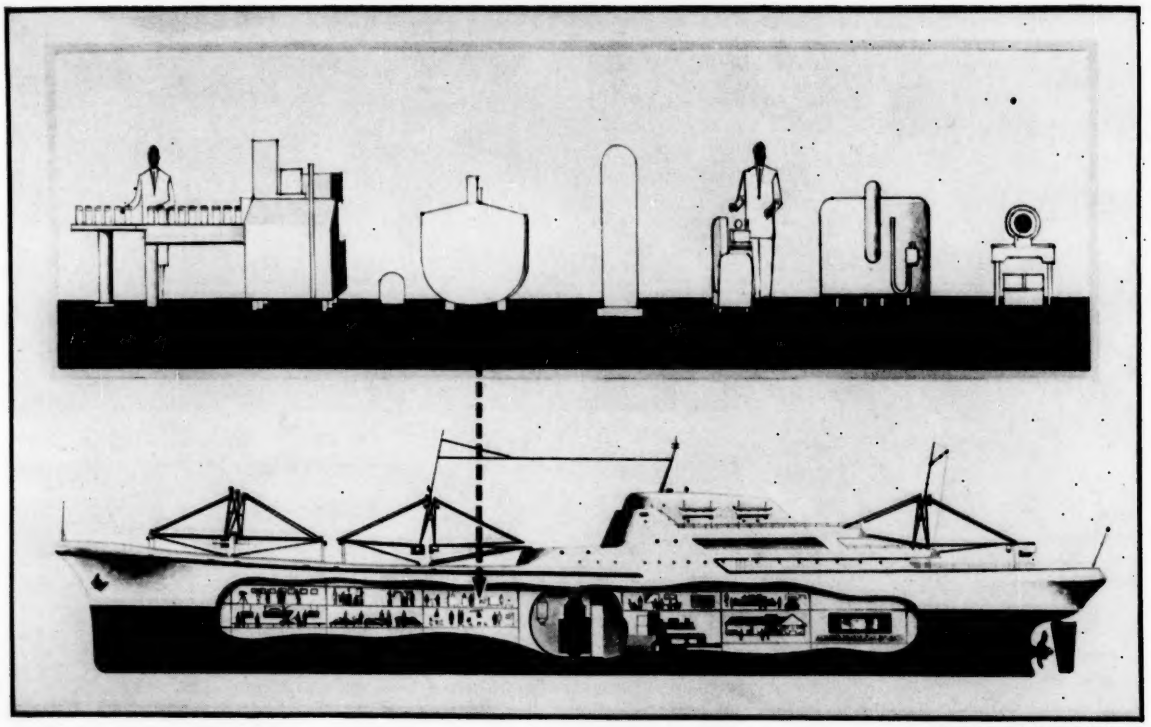
The entire air conditioning system is fully controlled from a central station which could be called a supervisory center. Temperatures throughout the building are indicated and can be recorded by manipulation of selector switches. In addition to temperatures, humidities can also be indicated and recorded. Outdoor temperatures and humidities, plus conditions in air washers are as close as the finger tip of the operator who pushes the button. The boiler room is also automatically controlled from such a center. All boiler room and engine room equipment is color-coded, as are all lines in the hospital.

In the aerial photograph of the Baptist Memorial Hospital which accompanies this article, the Y-shaped building is the new Madison-East unit, completed recently. The buildings to the right, and directly connected to the Madison-East Unit, are the old hospital buildings that are currently being air conditioned. The building under construction to the East (left in the view) of the Madison-East unit is the 10-story medical building which is completely air conditioned with a double duct high velocity system. All three of these buldings have their own plans which will be controlled from the center shown in the subject illustration.



Secondary system Madison-East unit, is served by 176 TR centrifugal compressor with the steam turbine drive pictured.

U. S. Dairy Group Active Internationally



Courtesy of *Pure-Pak News.*

Modern Dairy Exposition Proposed for Nuclear Merchant Ship

▶▶▶ CONSTRUCTION of the world's first atomic merchant ship has become a reality. However, before the N. S. Savannah even went on to the drawing boards, arguments arose as to the applications. Should the first vessel be a tanker, should it be a dry cargo vessel or should it be a floating exposition to tour the world? President Dwight D. Eisenhower in May 1955 offered the latter idea to Congress but it was rejected. Although the Savannah is well under way, proponents of the tanker ship idea may still be first as there is considerable pressure to install a nuclear propulsion plant in a tanker hull under construction.

Recently, however, the Pure-Pak Division, Ex-Cell-O Corporation, Detroit, proposed again that the Savannah be used as a symbol of American ingenuities for adapting the war potential of the atom to peaceful purposes. The proposal for international goodwill is to sail the Savannah around the world for her maiden voyage. On that voyage it is suggested that the Dairy Society International and other organizations, equip the vessel and show other nations examples of how Americans bring their abundance of national resources to all peoples.

Since the Savannah is to be equipped with the most modern salt water distillation system, Ex-Cell-O officials proposed that her holds be stowed with surplus powdered milk. The idea is to bring the two together, the powdered milk and the pure distilled drinking water, and package this "milk of human kindness" in cartons for distribution to the world's undernourished and poverty stricken peoples. The entire dairy operation could be carried out on a deck space as small as 16x40 ft.

Idea Started by DSI

The Dairy Society International was formed 11 years ago by the American Dairy Industry. Through DSI, American dairymen and dairymen suppliers are helping to dispose of surplus being carried by the Federal Government. George D. Scott, Ex-Cell-O's Vice-President, serves on the DSI Board of Directors and is chairman of the equipper sub-committee for membership.

According to Pure-Pak News, Spring 1958, the Savannah milk packaging plan is practical. Bulk containers (100 lbs) of powdered milk would occupy less than 5 cubic foot of storage space. Storage of 400 flat quart cartons is just another cubic foot. Therefore, less than 6 cubic foot of storage space would produce 400 quarts of milk. Another important advantage of the carton idea is that messages of goodwill can be printed on the side panels in different languages.

Totally Equipped Dairy At Brazilian Trade Fair

▶▶▶ OPERATING at full capacity to provide fresh tasting milk and ice cream for thousands of visitors, a complete dairy demonstrated use of "off-shore" dairy products at a tenth International Trade Fair. Under the direction of Dairy Society International, working as Cooperator with the Foreign Agricultural Service, USDA, the dairy was a featured part of the Brazilian Agricultural and Food Exhibition at Sao Paulo, June 18 to July 18, 1958.

Processing equipment for recombining nonfat dry milk and anhydrous milk fat, is loaned to the society from 21 U.S. companies. Product for the samplings and demonstrations are furnished by USDA from surplus commodities. Altogether some 300,000 samples of milk, ice cream and cheese were given out during the month-long showing.

Domestically, the Milk Industry Expands

Milk With Vegetable Oil

▶▶▶ REPORTING in their News Bulletin, May 1958, Stanford Research Institute, highlighted the development of a "modified recombined milk". This new milk, according to the Menlo Park, California researchers, is prepared from dry non-fat milk solids fortified with vitamins, vegetable fats and water.

Developed by a nationally known dairy research foundation, the product was referred to SRI for verification of nutritional values. Results of this study point to the feasability of conducting clinical tests to establish the suitability of the new product for human consumption. Object of the new product is to dispose of U.S. surplus to countries where fresh whole mik is in short supply.

Export canned evaporated milk is proving too costly for distribution to many of these countries. Milk solids, are more economically packaged and can be shipped at one-fifth the cost of the canned product. At destination these solids can be reconstituted as milk by the addition of water and vegetable oils. Domestically available oils would be used.

Frozen Milk in England

▶▶▶ RESEARCH carried on for three years by Brown & Harrison's Dairies, Ltd., a Southampton, England firm, has resulted in the development of a frozen milk which is palatable on thawing. MODERN REFRIGERATION reported the development recently, indicating that the milk is concentrated and packaged in sealed transparent plastic, the blocks measuring 18x10x4-in. The product is from freshly homongenized pasteurized full cream milk and is said to resemble butter in appearance. The firm reports good results from use on liners sailing from the United Kingdom. They have also received inquiries from oil companies in the middle East and Persian Gulf, and also from West Africa. Airline companies and fishing trawler operators have also made inquiries concerning the product which saves considerable space over traditional fresh milk containers.

Bulk Milk Transportation To Exceed Can Shipments

▶▶▶ JUNE being dairy month, Agricultural Marketing, a publication by USDA, devoted practically a third of the issue to the milk industry. Two articles highlighted bulk milk handling while others dealt with milk marketing in Alaska, household market for butter, and the mechanical milkman for schools, offices and industry. The two articles on bulk milk emphasizes the transition from can to tanker in transportation from dairy farm to processor. Statistics show that bulk milk will not only exceed can shipments in 1958, but premium prices are being offered to effect the change-over.

The trend from can to tanker for milk shipments has lagged in other parts of the United States as compared with Wisconsin. In 1956, INDUSTRIAL REFRIGERATION reported on a modern milk plant installation in Milwaukee. At that time the entire raw milk received by a leading milk plant was in bulk transportation. A number of other larger plants expected their receiving stations to convert can receiving lines to tank truck receiving before the end of that year.

Borden Company Expands Arizona Installation

▶▶▶ COMPLETION of the half million dollar expansion program at Fourth Avenue and Madison, Phoenix, by the Borden Company, enables the firm to supply ice cream throughout Arizona. Formerly ice cream had been supplied to the state from the firm's El Paso, Texas plant. Opening of the new plant was highlighted by evening tours of employees, producers and customers for approximately a week.

The plant occupies a building adjacent to the milk plant formerly used by the Borden Cheese Division. At present only three freezers are in operation with a 2,000 sq. ft. hardening room, and a higher temperature storage room for ingredients. The hardening room kept at minus 20 has a central duct cooling system permitting a higher ceiling than is usual in refrigerated rooms. Handling of the ice cream cartons is by means of wire baskets placed on pallets. The firm is featuring a "see-through" ice cream container. Other processing equipment involving refrigeration included stainless steel milk storage tanks, pasteurizer and a chilled water tank.

New Processing Plant For Sunny Brook, Portland, Ore.

▶▶▶ CONSTRUCTION was started in mid-June on a $300,000 modern dairy processing plant for Sunny Brook Farms Co., a 21-year old Portland, Ore., dairy products firm. J. L. Sinner, president, said the expansion program is being undertaken to better serve the company's growing market for milk, ice cream and cottage cheese. Besides its own products, the dairy is area distributor for Kraft cheeses. Sunny Brook Farms is entirely a wholesale dairy supplying food stores, restaurants, and institutions.

Features of the new plant will include a hostess room and model kitchen for use as a meeting place for community groups and clubs up to 125 persons, plus a modern version of the old-fashioned ice cream parlor. Two story in structure, the building will be 118x160-ft. with enclosed loading docks on two sides. Tilt-up concrete will be employed in the construction, and processing rooms are to have 24 foot ceilings.

Refrigerated Areas

Milk processing room is indicated as being 74x40-ft, the cottage cheese manufacturing and ice cream production each 28x40-ft. Refrigerated storage will be 45x37-ft and the ice cream hardening room at minus 30 F will be approximately the same size. Flash pasteurizing equipment will be installed, heating milk to 220 F and then cooling it to 38 F in 13 seconds. The ice cream freezers consist of three Vogt units with 450-gal/hr capacity.

High speed bottling will be a feature of the plant. Alongside the 120 qt/min machine will be a Pure-Pak half-gallon bottling line. Refrigerated tanks will hold approximately 6,000 gals which will be received by tanker delivery. Customer service trucks (21) are mechanically refrigerated.

Gulf Supermarket Concern Expands Ice Cream Plant

▶▶▶ AIMING at one million gallons of ice cream annually, J. Weingarten, Inc., expanded its ice cream mix manufacturing facilities recently at a cost of $200,000. A quality control laboratory and facilities was included in the program. Refrigerated equipment added to the plant include two 300-gal pasteurizers, a 600 gal/hr plate cooler and refrigerated storage tanks.

Weingarten's ice cream plant was constructed nearly ten years ago as part of an $8½ million dollar expansion program. A supermarket concern, the firm was the first food retailer in the Gulf area to produce its own ice cream. Additional retail outlet brought about the need for the ice cream plant addition.

Raleigh Warehouse Plans Second Increment

Interior walls of the Southeastern Bonded Refrigerated Warehouse are stripped with dunnage, not so much for protection of the finish and insulating materials as for the protection of the product. These wood risers with their horizontal stripping prevent the product from being stored against side walls, and thereby assure adequate ventilation between the stored products and the room perimeter.

▶▶▶ RECOGNIZING that fast delivery must be coupled with low temperature storage in order to perform its function in the channeling of frozen foods from packer to retailer, Southeastern Bonded Refrigerated Warehouse located in a 4-states area where it could best achieve these objectives. In the last quarter of 1957 the firm opened its first section of freezer space, 160,000 cu. ft. A second increment is to be started shortly. Third and fourth increments are scheduled for 1959 and 1960, respectively.

Low temperature storage teamed with fast delivery to chain stores, distributors, institutions and other primary purchasers accounted for the success of the operation. President P. E. Poole stated that "consolidation of storage and transportation offers food packers an opportunity of making products readily available at all times to nearby outlets. Buyers too have been able to maintain reserve stocks at finger tip control."

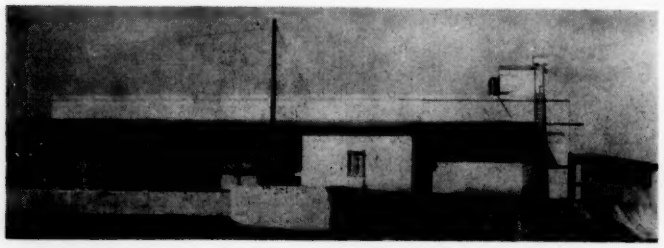
Southeastern Bonded Refrigerated Warehouse is serving the 4-states area around Raleigh, which consists of course of the Carolinas, part of Virginia and Georgia. Processing sites are available on property adjacent to the warehouse and a number of packers have availed themselves of these areas for construction of facilities for processing, packaging and cartoning. Executives of the new warehouse finds that such services are expected by producers of food perishables.

Step-by-Step Construction

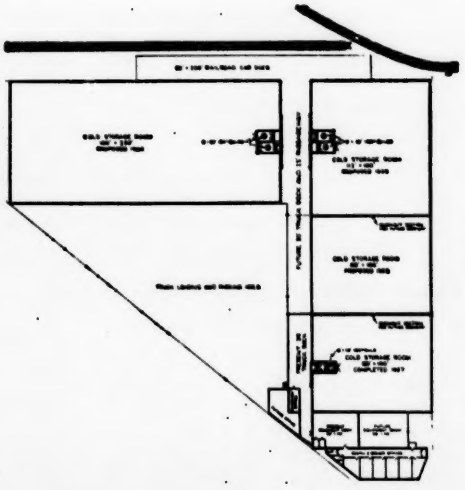
Construction of the first section of the Southeastern warehouse was begun at mid-year, 1957. Before Christmas the 160,000 cu. ft. was full, evidence of immediate success. The 1958 increment will bring the total storage space to 320,000 cu. ft. Present plans call for an additional 224,000 cu. ft. in 1958 and 460,000 cu. ft. in 1960, for a total of one million cubic feet of refrigerated storage.

First section of the warehouse was completed in 110 days, a near record. Construction features include a specially constructed insulated cement floor poured in place. Under-floor heating is provided to prevent ground freezing and subsequent buckling of the floor and foundation. Prefabricated wall sections were used and a new type integral insulated structure under a tar and gravel roof was installed. The prefabricated wall section was furnished by the Recony Sales and Engineering Corp. of Richmond, Virginia, who are the designers.

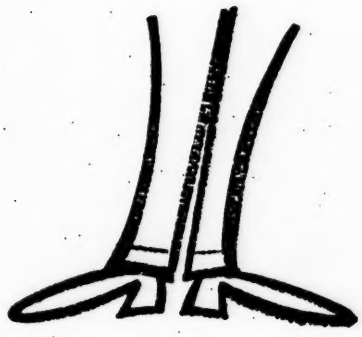
As new sections are added to the present warehouse, it will only be necessary to add compressors and intercoolers to the original engine room equipment. Of course, coils will be provided in new storage rooms, but the plant of this refrigerating enterprise is ready and waiting for each addition planned. It is equipped and laid out to serve the entire demand of one million cubic feet of low temperature refrigerated storage.



First of the four section installation at Raleigh, N. Carolina, this edifice houses an 80x100 ft minus 5 F freezer storage room completed in 1957. Present equipment room occupies 30-ft frontage under the economizer (condenser) shown on roof. Horizontal sliding door provides access.

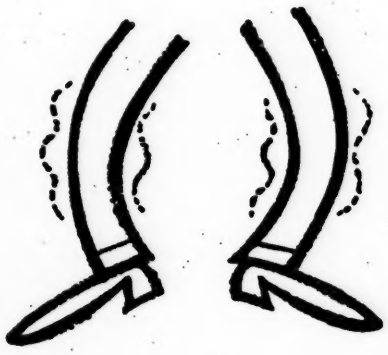


At right, plant view showing construction in 1958 and that proposed for 1959 and '60. Total space will be one million cu. ft. for low temperature storage.

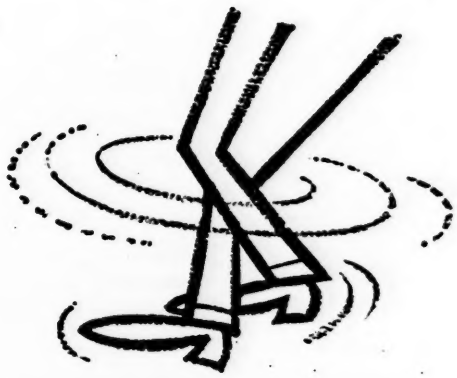


March—Began buying lower grade ammonia at bargain price . . .

Later—Non-condensable gases formed, head pressure up . . .



Still later—Too much moisture, float valves frozen . . .



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NAPRE QUESTION BOX

H. P. Hayes

HAVE A QUESTION? Address it to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif. Answers appear monthly in this department on problems forwarded by NAPRE members. Comments from all readers welcomed.

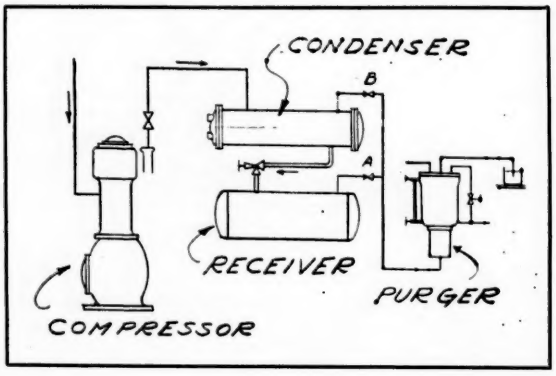
Correct Purging Point

QUESTION: When an automatic purger is used, is a purge connection from both the receiver and the condenser required? Or is the purge connection from the receiver only sufficient?

The following conditions are applicable:

(1) Only one condenser and one receiver are involved.

(2) The condenser is evaporative in one installation; shell and tube conatmospheric cooling tower, in another.



Referring to the accompanying drawing, will purge connection "A" from the receiver give sufficient purging? Or, should purge connections be provided at "A" and "B", with purging being done either from the receiver or the condenser, as may be required?

—T.H.R. & D.D.W., Chicago

Editor's Note: Many answers were received—too many for publication, and many in disagreement. Several are summarized below. Most replies, of course, are based on individual's own plants or experience. It may be that this topic warrants presentation at an NAPRE annual meeting, or feature treatment in INDUSTRIAL REFRIGERATION.—H. P. Hayes.

ANSWER No. 1: In case No. 1, in which only one condenser and one receiver are involved, and the equipment consists of a shell and tube condenser, the purging connections should be made at both Point "A" and Point "B" with purging being done at either "A" or "B" as required.

In case No. 2, using an evaporative condenser, it is considered good practice to locate the oil separator at a point just before the hot gas line enters the condenser unless the separator is water cooled. This would further assume that the condenser would be located on the roof or would place the oil separator at the other high point. This arrangement would place the oil separator at the highest point in the system and the top of the separator would represent the most attractive point at which to purge. The receiver purge connection would be retained.

—J.A.H., San Luis Obispo

ANSWER No. 2: Based on my nearly 45 years of experience, I would say the correct place to purge a refrigeration system is from the top of the receiver. Connection "A" is the only one needed.

Regardless of the type of condensers or how many of them there is no need of connection "B" as per sketch.

The receiver should have an equalizing line run from the top of the receiver to the top of the condenser.

—C.A.C., Memphis.

ANSWER No. 3: Acording to the sketch in IR, the system shown does not have an equalizing line between the condenser and receiver; and, therefore, we will assume that the liquid line is large enough to have proper drainage from the condenser and also non-condensable diffusion and flow from condenser to receiver and vice-versa.

If the receiver is an operating or surge type receiver, purge from the condenser connection for any type of refrigerant (shell and tube condenser).

If the receiver is a pump down receiver, purge from the condenser for a halocarbon system and purge from the receiver for an ammonia system (shell and tube condenser).

If the system uses an economizer (evaporative condenser) instead of a shell and tube condenser, purge from the receiver no matter what type of refrigerant or receiver. But, it is important that with the use of an economizer the inlet to the economizer be equalized with the receiver.

—R.E.Z., Madison.

Salt Water Ice

QUESTIONS: Where can I find additional data on salt water ice for fish preservation?—F.W.T., Pensacola.

Editor's Note: As one reader wrote —"It is said that it is the difference of opinions which makes horse racing interesting".—So also, it is the variance of ideas which gives additional reading value to the answers received. Only three are given in part here. All will be incorporated in a later INDUSTRIAL REFIGERRATION feature.

ANSWER No. 1: U. S. Fish & Wildlife Service has compared salt-water and fresh-water ices for the

—Continued on Page 23

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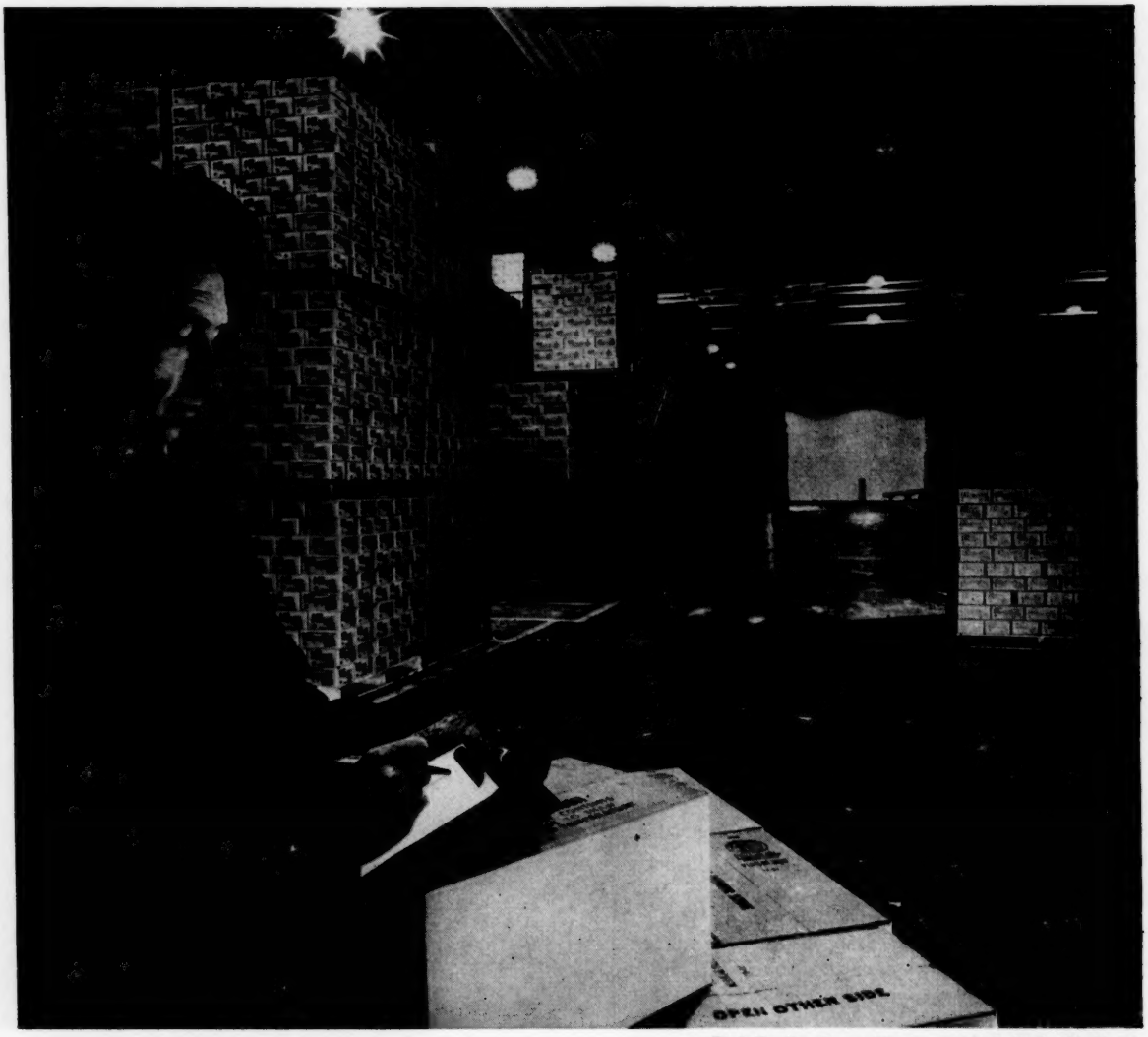

Birds Eye Zero-Storage Warehouse at Walla Walla, Washington

Styrofoam® cuts installation costs 10% at Birds Eye

After careful study, Styrofoam was chosen to insulate the floors, ceilings and walls of a zero-storage warehouse for Birds Eye Division of General Foods.

Over 500,000 board feet of Styrofoam were used. The choice of this insulation material resulted in a 10% savings in installation costs and, thus far, the complete absence of any vapor problems. Tests conducted by Birds Eye revealed that Styrofoam will preserve their food products for 48 hours after the ammonia has stopped circulating and that Styrofoam will insulate the ground from freezing for four to six weeks after the subfloor heating is turned off.

This is just one example of the many cold storage applications in which Styrofoam has provided economical and effective insulation. Because it has low heat transmission and unyielding resistance to moisture, Styrofoam has permanent insulation efficiency. Because it is lightweight, self-supporting and flexible, it offers advantages in handling and installation. This was demonstrated at Birds Eye by the fact that Styrofoam was readily contoured to the curvature of the roof.

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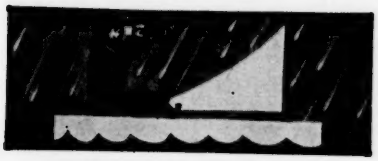

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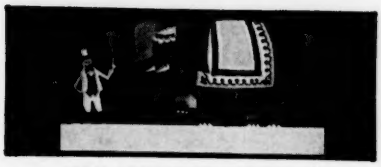


HIGH COMPRESSIVE STRENGTH
3000 pounds per square foot

EASY TO HANDLE
Lightweight, can be cut with ordinary tools

RESISTS ROT
will not attract vermin

ECONOMICAL
low in-place cost, low cost-per-year service

STYROFOAM

(Continued From Page 20)

preservation of eviscerated haddock. With both ices, good quality was maintained until the 9th day, and acceptable quality from then on to the 13th—but neither ice was superior to the other. Salt-water ice cooled the fish faster and to a lower temperature, but it also melted faster and left the fish with less protecting ice. Thus enough salt-water ice must be used to compensate for the faster melting rate. **TRRF.**

ANSWER No. 2: Consult World Fisheries Abstracts, Volume 8, Number 6, page 29, regarding an article on salt water ice.

Several years ago, I was in Halifax, N.S. and was taken through the Fisheries Laboratory there by the head of research, Dr. Beatty. Now it may surprise you for it certainly did me, but I found out that the Canadians were further ahead of us in Fisheries than the Russians were with their Sputnik. The French also have been doing extensive studies with the use of salt water ice and the reports of the work that I have read have been very encouraging.

In one test we put two fish of equal size in boxes. One of the boxes contained fresh ice and the other contained ice made from a salt solution with a salt content equal to that of seawater. After two days time, the body temperature of the fish refrigerated in fresh water ice was measured with a skew thermometer and found to be nearly 40F, whereas, in the case of the fish in the salt ice had a body temperature of nearly ten degrees lower.

Chemical analysis of fish stored at minus five, in a test at the Canadian laboratory, shows keeping quality for eleven months without losing flavor; whereas, there was a loss of flavor in three months if the storage temperature was plus five F. I would like to say again however that this test was a chemical analysis and not a "taste test".—**F.W.T., Pensacola.**

ANSWER No. 3: It is difficult to form salt water ice since the water separates from the ice in the freezing process. So complete is the separation that one method of desalting sea water now being considered, is by the freezing process. The melting point of ice, however, can be lowered by the use of salt. If sufficient salt is used the melting point of ice can be lowered to 0° F.

—N.S., San Luis Obispo.

Recirculation System Fails Marine Application

QUESTION: We see that under the Question Box there are replies to technical questions given by the readers. We should much appreciate a detailed report as to the following:

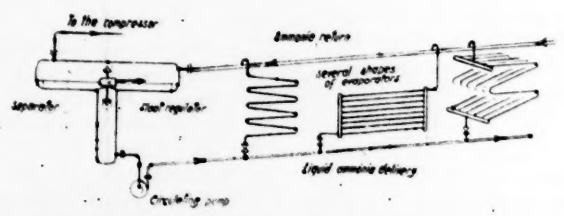
In the plants with ammonia circulation by means of a circulating pump we frequently let the ammonia circulate to the evaporators supplying same in the under part in order to discharge gas from the upper part. The supply pipe coming from the pump rises possibly in continuous pendency to the evaporators, the supply to the evaporators is parallel and the return pipe to the separator goes in continuous inclination to same (see Sketch No. 1)

of ammonia brought to the circulating pump; ammonia goes back to the separator through a 1-in. pipe. Evaporating temperature is minus 30° C.

We saw in this plant that ammonia returns almost suddenly back in big quantity to the liquid separator and fills it, keeping thus closed the float regulator for 40 or 50 minutes, while, when the float regulator opens itself, remains open for 50 minutes more; operation goes on in this way, filling and emptying in the same time also the liquid receiver of the condenser.

Please note that the pump, for space exigencies, is placed just under the separator, and thus with scarce

SKETCH n°1



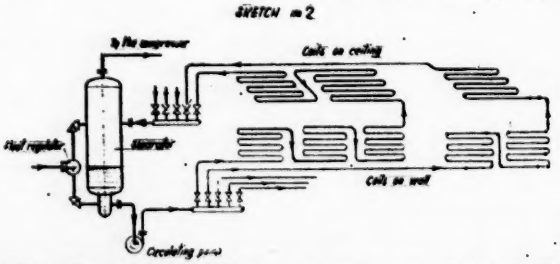
In a plant on a ship we placed the evaporators, formed by 3/4" smooth pipe coils, in groups of coils connected in series on each supply

liquid column on the suction side. We think that intermittence on return of liquid is due to the fact that as the coils are in a group in series and be-

cause of the ship's undulation which disposes the pipes alternatively with opposite inclinations, ammonia steam in the pipes pushes forward the liquid almost as long as it is exhausted, favored by successive dip pipes formed by the curves.

Now, before the above mentioned phenomenon can begin again, the coils, almost empty of liquid, must charge themselves again with ammonia and when same is sufficient to act as hydraulic valve on the dip pipes on the curves, back-water on the separator begins once more. The inconvenience can be favored by the momentary reduced efficiency of the pump. The float regulator undergoes to these fluctuations and so it remains long closed or open.

We should like to take, in order of importance, the following remedies:
1) To place a second pump for liquid ammonia circulators on an almost inferior altitude as the present pump, in order to make sure and intensify ammonia circulaton in the coils.
2) To connect the vertically disposed wall coils in branch instead of in series, on the pump's liquid ammonia distribution.



3) To substitute the mechanical float regulator on the separator with an electric floater having a solenoid valve, in order to supply again more promptly the liquid when the level in the boiler is going to remain insufficient for a long tme and keeps the regulator open.

We shall be grateful to you if you will arrange for giving us an answer to the following questions:
a) Are you already acquainted with such troubles:
b) Do you agree with the explanation we gave about the phenomenon?
c) Do you think our remedies will be sufficient to eliminate the inconvenience and which one do you think is the best?—C.D'O., Milan, Italy.

ANSWER No. 1: Answering the points raised: a) Slugging can take place in long runs of pipe connected to a pump and accumulator. This phenomena is primarily caused by the trapping of the liquid in the suction line and in the return bends of the coils. It is our opinion that should all of the liquid traps be eliminated in the piping, the undulation of the ship would not cause any serious slugging.

b) The explanation which was given on the phenomena, which G. D'O. refers to as a hydraulic valve on the dip pipes on the curves, is agreed with completely; i.e., the coils tend to fill up so fast that the pump loses prime, then the coils slug back to the accumulator and the float regulator remains off for a period. It is alternately off and on, and naturally the regulator has insufficient capacity to feed at the rate that the liquid pump feeds, since it probably was sized for the rate of evaporation and not the rate of recirculation.

c) Without further details on the load and the configurations of the job, there cannot be additional comment on what would be accomplished with adding a second pump (which is the first remedy (1) suggested).

The second suggestion (2) to connect the vertically disposed wall coils in parallel instead of in series is most desirable.

The third remedy (3) suggested proposes an electrical float switch instead of a mechanical regulator. Re-interpret this as a proposal to provide a float regulator that has enough capacity to keep the pump primed. Naturally this can be accomplished with either a mechanical or electric type. It is concurred that this would be a partial remedy. However, it does not get to the root of the problem which is the liquid trapping.

Further, a remedy is suggested for the system as shown in Sketch No. 2. In addition to connecting the coils in parallel instead of in series, if it is possible, lower the position of the present accumulator. Reverse the flow through the coils so that they are fed in the top and drained away from the bottom. With no liquid traps in the return to the accumulator, the primary cause of the slugging would be eliminated.

Also, a metering valve should be installed at the inlet of each coil in addition to the valves shown in the discharge and return manifolds, for the purpose of balancing the flow through each coil so as to prevent possible slugging in one coil while starving in another.

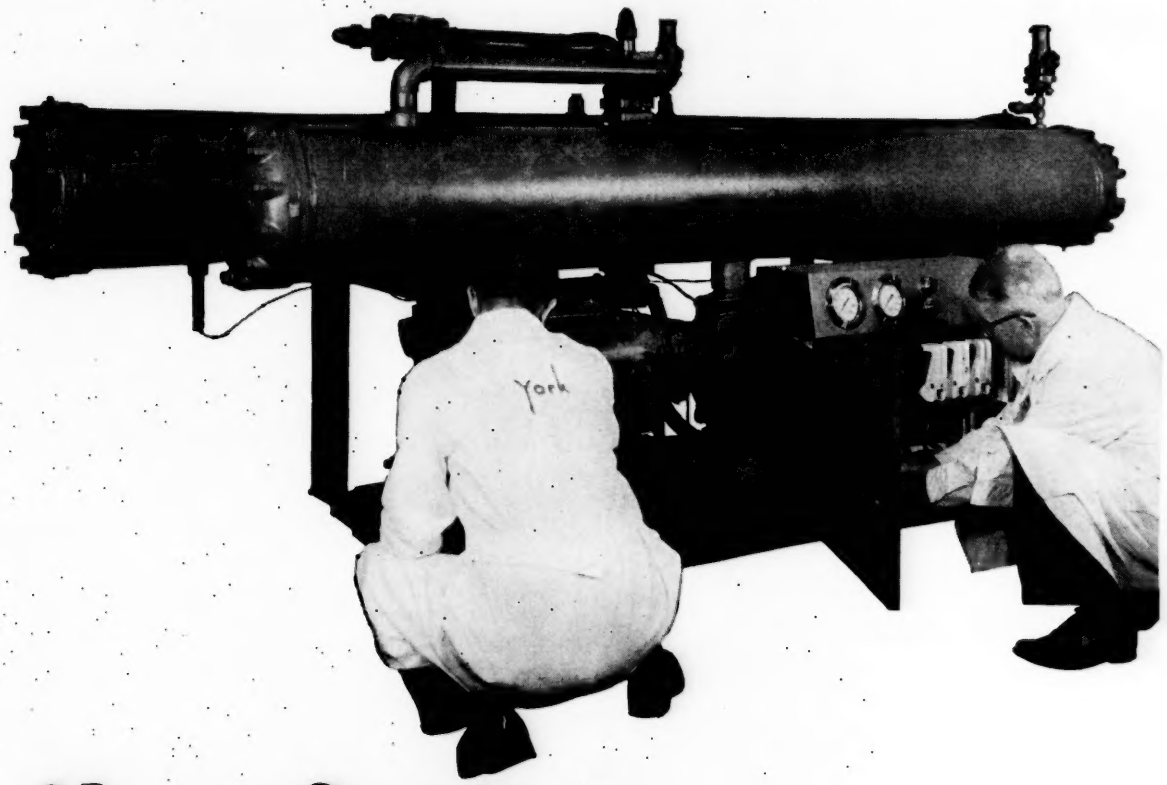
Finally, if it is not possible to recircuit or relocate the components, an alternate remedy would be to provide a gravity drain from every piping trap or low point between each coil, or at the point of any suction line rise, so as to gravity flow trapped liquid into a sump from which it may be removed by an additional pump. This second pump would operate from an electric float in a liquid trap alongside, into which all of the piping traps would drain. **—W.V.R., Chicago.**

ANSWER No. 2: It would seem that the performance might be improved if these coils were placed in parallel instead of series arrangement. In the case of a long coil, it might be further advisable to break it into shorter lengths, or in other words consider the use of headered coils. This is based on the assumption that they want to continue to try and use the flooded system with the pump.

About the only benefit which might be derived from the use of a float switch, solenoid valve and hand expansion valve combination to replace the low side float valve (low pressure float valve), would be to avoid wire drawing the pins and seats in the low side float valve. Perhaps G.D'O. may have had in mind that the float switch and float valve would feed larger quantities of the refrigerant to the evaporator in a shorter period of time than would be possible through the low side float valve. A great many engineers make this mistake by not using a hand expansion valve, or if it is used by not properly throttling it. When this happens the evaporators can be overfed before gravity equalization in the float switch chamber will allow the solenoid valve to shut off. In addition, the suction pressure will be raised to a higher value than is desirable and may cause trouble in the performance of the evaporator.

Primarily the requirements for an electronic float switch arise from low temperatures which would cause freezing of mercury, or the required use of this float switch in a location where a remote control box placed elsewhere is desirable. It is also possible to change the range or the differential by a limited amount with the electronic float switch.

Setting of the hand expansion valve with either float switch must be carefully done. **—J.A.S., St. Louis**



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REFRIGERATION'S ROLE IN MISSILES

Orifices for missile liquid oxygen lines undergo sizing test at the Wyle Cryogenic Laboratories.

LOW TEMPERATURE liquids and their refrigeration at manufacturing and storage stages play a very important role in this age of missiles. Further, refrigeration and air conditioning have a very pronounced supporting part in design, manufacturing, testing, and launching of such objects. Even in flight, refrigeration in several applications involving direct support and indirect back-stage roles is necessary to communications, and the control of navigation and propulsion of the space vehicle.

This role of low temperature liquids in the missile field, and the part played by refrigeration in certain phases of testing and operating electronic parts in missiles, was the subject of a talk presented by B. M. Bleak, engineer-in-charge, Wyle Laboratories, Norco, Calif., at the May 21 meeting of Los Angeles Chapter, NAPRE. Bleak presented the technical talk and A. L. Wilfinder of the laboratory staff projected a series of slides depicting the Company's high-flow liquid-gaseous installations for testing missile components at Norco.

Facility Equipment

The Norco cryogenic facility of Wyle is designed to provide complete flexibility for performance test programs requiring liquid oxygen, liquid nitrogen, gaseous oxygen and gaseous nitrogen. Four major systems include a 10,000-gal vacuum jacketed liquid storage vessel and two 4100-gal liquid oxygen storage vessels; a 20,000,000-Btu heat exchanger; a weight rate system for calibrating flowmeters up to rates of 3,000 gpm; and high pressure gas storage for achieving high flow rates by the blowdown technique. Provisions are also available for combining performance testing with natural or any induced environmental conditions.

The blow-down system at the laboratory consists of 18 nitrogen or helium storage bottles providing gas flow rates up to 1000 lbs/min, when used in conjunction with the 10,000-gal/liquid oxygen-liquid nitrogen storage tank, and provide liquid flow rates up to 8,000 gpm. The blowdown system is equipped with Taylor instruments to establish and maintain any desired tank pressure during a blowdown test.

The laboratory's testing parameters include:

liquid oxygen or nitrogen—continuous flow up to 1600 gpm/100 psig or intermittent flow up to 8,000 gpm/100 psig;

gaseous oxygen or nitrogen—continuous flow up to 40 lbs/sec at 75 psig, at minus 275;

flowmeter calibration by the weight rate system, including liquid oxygen or liquid nitrogen, 5 to 3,000 gpm, with 1/2 percent minimum accuracy.

The Norco plant, according to Engineer Bleak, is technically known as a cryogenic facility. Cryogenics, he explained, refers to the physics of extremely low temperatures, and derives from the Greek word Kryos—cold.

Work at the Wyle Laboratory in Norco is primarily with various testing of missile components, the major activity dealing with low temperature liquids. Two of the liquids commonly used in testing are liquid oxygen and liquid nitrogen. Bleak described liquid oxygen as a pale blue liquid which, at atmospheric pressure, boils at minus 297.4 F; and liquid nitrogen as a clear and colorless liquid which has a boiling point of minus 320.4 F.

Reduction of Test Hazards

The speaker explained that due to the similarity between liquid oxygen and liquid nitrogen, and the availability of both, liquid nitrogen is frequently used as a substitute for liquid oxygen in test programs. The reason is that nitrogen, being totally inert, reduces hazard in tests where certain reactions may be unknown.

"At atmospheric pressure", Bleak said, "these fluids will boil much the same as water at 212 F. Thus, it can be seen that there is a necessity in taking all possible measures to stabilize the fluid and reduce boil-off losses. To illustrate one of the problems involved in handling these liquids, particularly in uninsulated systems, picture attempting to accurately evaluate flow and pressure drop conditions with boiling water while passing it through pipes maintained at a temperature of approximately 400 F!" Engineer Bleak explained that the large differential between liquid oxygen temperature and atmospheric temperature creates boil-off rates which in many instances are intolerable. (See Table I).

Problems In Common: Ductility and Expansion

The speaker indicated that there may be several problems encountered in cryogenic work which, while being considered unique to that field, are probably encountered to some degree in the refrigeration industry.

Excessive contraction and distortion of tanks and piping. Bleak stressed that in every design of low temperature test systems, those factors must be given special consideration. "Careful analysis of every piping configuration", he said, "has been proved necessary in order that every possible movement or distortion of the system be contemplated. A large field of special expansion sections has been developed. It is necessary that every portion of a proposed test system be engineered for inclusion of these special sections, and allowances made for free movement of piping and components".

Cryogenics For Rockets

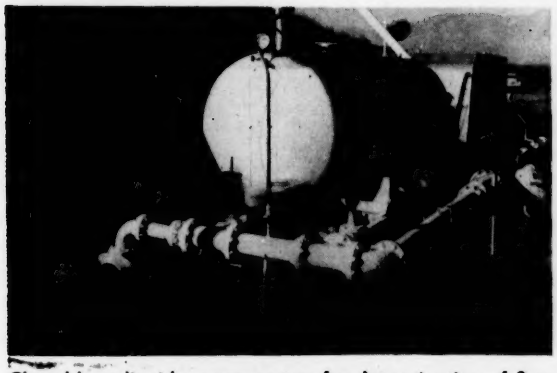
After concluding his description of the problems of handling and design, Bleak discussed the various ways in which cryogenic liquids are used in rocket systems. Liquid oxygen, as commonly used in the missile, cannot be considered a refrigerant since its primary purpose is to serve as an oxidizer for the fuel carried. Basically similar to Diesel fuel but differing in that a Diesel engine receives its oxygen from the surrounding air, the rocket engine requires a concentrated supply of oxygen due to the high burning rate and lack of atmosphere in the regions where it operates.

Approaching refrigeration matters more directly, Bleak stated that the use of liquid oxygen in missile systems presents many problems allied to the refrigeration field. However, he stated, refrigeration systems commonly used are not employed in the missile proper.

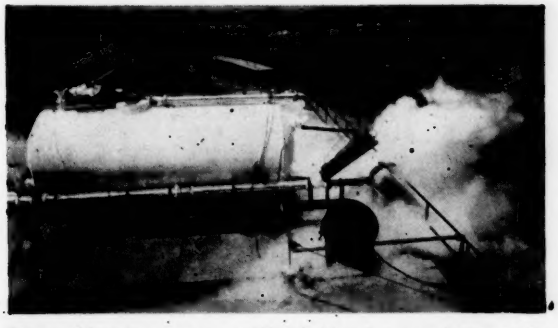
"Of course, the speaker said, "refrigeration does play its part in the ground installations and trailer assemblies where a high concentration of electronic equipment requires refrigeration and air conditioning systems in order to prevent heat exhaustion of the launching personnel, and to prevent overheating of the electronic equipment itself. Moreover a type of refrigeration system does exist in both the ground support and the missile itself where liquid nitrogen is used as the cooling system.

It is commonly known that helium is used as a pressurizing medium for the missile fuel and liquid oxygen tanks. Helium is cooled below minus 300 F for an obvious reason. The speaker explained that for a given volume of storage space within the missile itself, approximately three times more helium may be stored at minus 300 F than could be stored at a normal ambient of 70 F.

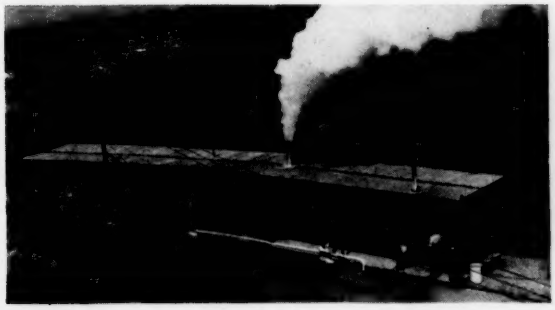
By FRED HERR
Los Angeles Correspondent



Closed loop liquid oxygen system for determination of flow characteristics of a missile component. Instrumentation is located in the trailer parked back of tank.



Flow calibration system at Wyle's Norco operation tests the device up to 25 gpm with liquid nitrogen. This system, scale mounted, discharges to recovery tank below.



Gaseous nitrogen produced from liquid state tests a vent valve at 4 lbs. per second. Blower unit at left supplies 20,000,000 Btu/hr heat exchanger. Test specimen is mounted at the right. Vertical plume is from by-pass control.

TABLE I — BOIL-OFF RATE FOR OXYGEN STORAGE 4000-GAL. AT ATMOSPHERIC TEMPERATURE — PRESSURE

Vessel	Rate
Un-insulated	100 gpm
Glass Wool, 4-in	25 gpm
Polystyrene, 8-in	10 gpm
Blown Perlite, 12-in, under Vacuum	1 gpm

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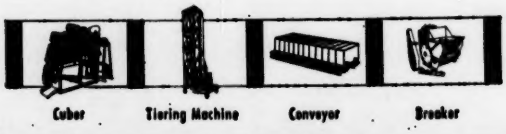


HEADQUARTERS FOR ICE HANDLING, CUBING AND SIZING MACHINES AND TOOLS

The so-called refrigeration of this helium, Bleak declared, is accomplished both on the ground and in the missile proper by the use of either heat exchangers where a coil is immersed in liquid nitrogen, or by actually storing the helium containers themselves within a liquid nitrogen bath. However, the problems of storing, handling, transporting, insulating and the hardware required for liquid nitrogen systems are problems peculiar to that field, and are not normally encountered in general refrigeration, Bleak pointed out.

Use of Liquified Hydrogen

Liquid hydrogen, also employed in missiles, is, of course, not a refrigerant. And, the problems of transportation, storage, insulation, etc., are even more critical with it than with liquid oxygen due to the temperature of the fluid—minus 423 F!

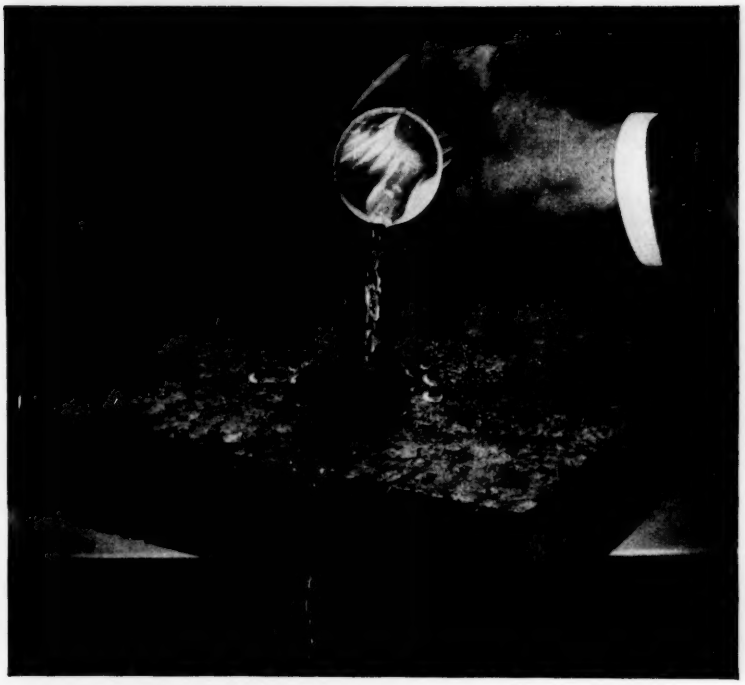
"By liberal application of the term refrigeration", the speaker said, "we can discuss the use of liquid nitrogen as an insulator for liquid hydrogen containers. Normally a vacuum jacketed container called a Dewar is used for most liquified gases. It contains only Perlite plus a reflecting external surface to minimize heat leak through an annular vacuum space. For liquid hydrogen containers, a liquid nitrogen jacket is occasionally used surrounding the vacuum jacket, which reduces the temperature differential across the vacuum area. On the surface it does not appear to be an economical solution to the problem of storing liquid hydrogen. However, when the expense of liquifying hydrogen is considered versus that of liquifying nitrogen, the justification for the liquid nitrogen jacketed Dewar becomes apparent".

Expendable Refrigerants

According to Bleak, liquid nitrogen is occasionally used in laboratory work in the field of environmental testing, to provide an ambient temperature around a specimen at temperatures in the realm of minus 150 F. to minus 320 F. The reason for achieving such a low ambient temperature, he explained, would be to simulate an environment in a missile compartment adjacent to a liquid oxygen or liquid nitrogen system.

In such an application, the speaker explained, the liquid nitrogen is literally sprayed into the test chamber where it immediately vaporizes, providing the desired cooling effect. Since the requirement is not of a continuous nature in the laboratory, it is not uneconomical to achieve temperatures of minus 150F with commercial liquified nitrogen, rather than a compression refrigeration system.

According to Bleak, "carbon dioxide is a common laboratory refrigerant used at Wyle in addition to the occasional use of liquid nitrogen as a cooling medium in environmental chambers. In that system," he explained, "liquid carbon dioxide is circulated throughout the laboratory and where a need for rapid low temperature refrigeration arises, a line is run to the nearest stand pipe and



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liquid CO_2 is sprayed into the chamber to obtain this refrigeration effect."

In the concluding portion of his presentation Bleak described some of the test programs which have been conducted at the Norco Cryogenics Facilities with the fluids referred to. One system is a closed loop, liquid oxygen system in which the liquid is drawn from a tank and passed through pumps to achieve desired flow rates and pressures, through the test specimen, and returned to the tank. Liquid oxygen flow rates of 2,000 gpm through lines as small as 4-in diameter have been achieved, he reported. That system, according to Mr. Bleak, is utilized to determine such parameters as pump characteristics and pressure drops of components which are in a flow configuration.

Testing Flow Systems To Fractional Percent Accuracy

Another system described by Bleak permits the laboratory to calibrate measuring devices at flow rates in excess of 2500 gpm with accuracy of one quarter of one percent. "This entire unit, including the test object", Bleak said, "is mounted on a scale and utilizes a blow-down technique. High pressure nitrogen gas is used as the prime mover in the main storage tank to create high flow rates. Through an intricate system of controls, the rate of weight change of the main storage tank is determined, thus permitting evaluation of the actual flow rate".

Rock Shelf Foundation For Gas Generator

Proudest achievement of the Wyle staff is the design and construction of a large gaseous nitrogen and oxygen heat exchanger. The unit converts liquid oxygen or nitrogen to vapor in the range of minus 275 F at the rate of over 300 gpm. Bleak described the unit as a 20,000,000 Btu/hr heat exchanger.

Set in concrete on a revetment cut into solid rock and using a propane-fired heater with 50 hp blower, it is capable of producing gaseous oxygen flow rates up to 40 lbs/sec at pressures up to 75 psi. The unit was designed and built by Wyle to permit performance testing of a wide range of missile valves or components which will be required to pass large quantities of low temperature gases. The heat exchanger incorporates more than half a mile of 2-in stainless steel tubing. Insofar as they know, Wyle engineers said that it is the largest heat exchanger of this type in the world.

Refrigerating Effect Close to 1700 TR

"It seems ironic", Bleak said, "with all of the energy expended to produce these low temperature liquids, that technicians should apply 20 million Btu/hr to convert this liquid back to a gas. However, this large gas evolution is necessary to meet test requirements of approximately 40 lbs/sec. Effect of this much vaporization, in terms of refrigeration, is approximately 1700 tons."

Vanguard's Valves Stiff

▶▶▶ NECESSITY for research outlined in the foregoing article on Wyle Laboratories, is explained by the International News Service item earlier in the year in which major technical difficulties encountered in the launching of Vanguard were blamed on valve freezing. They became stiff or frozen after long contact with liquid oxygen. Limit on holding liquid oxygen in a missile is said to be six hours.

Liquid Nitrogen In Israel

▶▶▶ LIQUID nitrogen has been produced and used at the Hebrew University, Israel, for the first time with the aid of an installation manufactured in the United States. It is said to be the only one of its kind in the middle east. Nearest like equipment is in Italy and India.

Frozen Italian Dishes Now

▶▶▶ FROZEN spaghetti and meat balls were introduced nationally last Fall by Luigi's Food Products, Pueblo, Colorado. Permission was received from the Federal food and drug authorities to market this product on a national scale. Since that time the firm has introduced other dishes such as macaroni and beef, and shell macs and pinto beans (which are better known as "Pasta e Fagiole"). Acceptance of the product is best expressed in the fact that the firm began with one packaged food freezer and a one-stove kitchen, and is now expanded to a six freezer production line.

Juice Concentrate for Jelly

▶▶▶ JELLY of good color and flavor is being produced commercially in limited quantities from fruit juice concentrate rather than single strength juice commonly used. This was reported by the USDA early in the year by the Agricultural Marketing Service. Frozen concentrates are shipped to jelly makers at considerable savings in storage and shipping charges, compared with the cost of handling the fresh fruit or the single strength fruit juices.

Canadian Publications On Peaches

▶▶▶ TWO REPRINTS are available from the Horticultural Experiment Station and Products Laboratory, Vineland, Ontario, Canada. "Peach Cooling in the Niagara Area" and "Tests of Cooling Rates in 1956 Experimental Peach Marketing Containers", both authored by J. H. L. Truscott, are the two pamphlets.

Low Temp. Development In Metal Adhesives

▶▶▶ TECHNICAL Report No. 2222, National Bureau of Standards, U. S. Department of Commerce, covers recent experiments at the Bureau's Boulder Laboratories on the effectiveness of metal adhesives at low temperatures. Sponsored by Atomic Energy Commission the experiments show that several filled epoxy resins exhibit considerable strength at temperatures below minus 400 F. Investigation was undertaken by NBS Cryogenic Engineering Laboratory to provide design information for a liquid hydrogen cooled electromagnet at the AEC Los Alamos Scientific Laboratory.

Tennessee Processors Ask Frozen Food Training

▶▶▶ ALARMED by the deficiency of personnel trained in food technology, a committee representing the Tennessee Frozen Foods Convention in mid-June recommended that the University of Tennessee establish a full department of food technology. So said William A. Boozer, Director of Mid-South Resources Bureau, by-lined in the MEMPHIS COMMERCIAL APPEAL.

Tennessee has had to go abroad in recent years to locate trained processors and even more important, inspectors, at a time when West Tennessee is producing more than half the national output of frozen okra, black-eyed peas and greens. "The area food processors find vital technicians in short supply, but it is not uncommon", Boozer writes, "for an inspector furnished by USDA to report for work at a West Tennessee frozen food plant and learn for the first time what okra and black-eyed peas are".

Seven County Food Basket

Lack of trained personnel has been termed pathetic in a seven-county West Tennessee area where farmers are now growing 7,500 acres of field peas, 4,000 acres of okra, 4,000 acres of green and spinach and 4,500 acres of lima beans. Of the 17-million pound national output of okra, 10 millions are grown in Haywood, Crockett, Hardeman, Gibson, Madison, Lauderdale and Fayette Counties.

Dean Webster Pendergrass, University of Tennessee, said food technology courses already outlined for instruction under horticulture, have not been offered "because of no staff and little student interest. As student interest develops the course will be activated", the Dean was quoted. Apparently, he put the responsibility for arousing student interest back on the industry.

Magazine Articles, Papers, Talks Abstracted By TRRF

▶▶▶ FIVE research projects reviewed in May and June TRRF Bulletins involved refrigeration. In Bulletin 58-5 (May) on Time-Temperature-Tolerance, a comparison is drawn between two types of exposure; one with a rise of 10 F and the other with a rise to 20 F, and return of both to zero in a period of a few days. There is a sharp increase in damage to the frozen food product as the temperature goes up from 10 to 20 F.

In the same issue, work conducted by Dr. John G. Woodroof and E. H. Heaton, Georgia Experiment Station, on the mold of peanuts when removed from refrigerated storage, shows more reports received during 1957 than previously. Mold was due to inadequate protection from warm and humid weather during transportation. The fact that the peanuts had been refrigerated was not a cause.

Condensation Control

Bulletin 58-6 (June) reviews the status of several TRRF aided studies. One summarized four methods of condensation control. After covering the tempering method, circulating air and protective packaging, the review dealt with the outgrowth of the study on packaging—the use of a temporary package during warming of products to their new surroundings.

At Rutgers University a project is under way on canning of foods by the high temperature short time method. HTST products are not only compared with these canned by conventional methods, but both are stored at 85 F and at refrigerated temperatures, and then quality tested. It is apparent, according to Dr. C. O. Ball, who is conducting the tests, that refrigeration protects the more sensitive qualities of tomato juice, cream-style corn, cut green beans, asparagus, oyster stew, vegetable beef soup, green peas with ham soup and others.

The TRRF bulletin reported from the project on freezing of candies that one manufacturer indicates increased sales in certain brittle and crunchy candies. The company has changed its formula to include lower-melting fats with improved flavor, while others use freezing to improve texture.

Technical Reviews

Both issues of the TRRF bulletin carried several pages of summaries on recent technical publications. These condensations give the source of the report, the publication, and a synopsis of the important element to food preservation by refrigeration.

Bulletin 58-5 reviewed some Cornell University tests on McIntosh Apples. Differences in rate of cooling were discerned in quality during the first three months in cold storage but thereafter less apparent. Five rate of cooling treatments requiring a storage of 32 F included hydro-cooling to 40 F, and 3-day, 1-week, 2-week and 3-week air cooling. Controlled atmosphere storage was also included. Apples stored under controlled atmosphere did not scald and there is no brown core disease. Three-week cooled fruit is the first to scald.

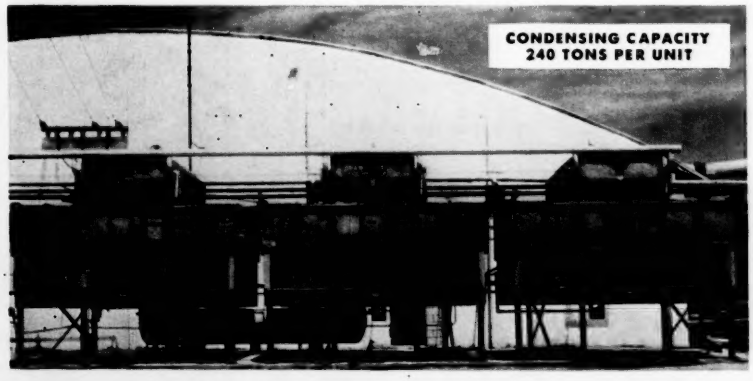
Other technical papers listed by the bulletin dealt with specific heat and heat conductivity of citrus, lettuce seed, cottonseed and canteloupe storage. Chilled citrus sections, one synopsis in the TRRF monthly, dealt with protection of chilled citrus segments in glass. The product was stored at 34 to 36 F for a year or longer. Bulletin 58-6 dealt in some detail with the bulk orange concentrate process after last winter's freeze in Florida.

Poultry Reviews

The growing importance of poultry is indicated again by the amount of work reviewed. The bulletin for June dealt with a half-page review of work by J. D. Mitchell and Dr. W. B. Stadelman of Purdue University. Essentially it is the same data reported at the TRRF annual meeting in Dallas in March. Reprints of that discussion are available from TRRF.

Bulletin 58-5 also carried a review of the freezing of poultry in air by L. Van Der Berg and C. P. Lentz, of the Canadian National Research Council. The report stated "lightness and uniform appearance of vacuum-packed birds depended on freezing rate and increased markedly when air velocity at minus 20 was increased from 0 to 700 ft per min, or when temperature (at 500 fpm) was lowered from 10 F to minus 20 F. Further extension of air velocity or temperature had little effect. Bird size had little effect except on freezing time."

The June Bulletin carried two reviews on seafoods; one on chlortetracycline for preservation of gulf oysters, and the other on the freezing of fish in alginate jelly. High humidity in meat freezers through the use of ice coated canvas sheets was reviewed in still another item. Correspondence reporting on commercial experiences with garlic and with English walnuts was summarized briefly in two more single paragraph digests.



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MANUFACTURERS' NEWS

United Announces Changes

▶▶RETIREMENT of Porter L. Swift as New England Division Manager, United Cork Companies, was announced at mid-year by Henry Bose, President of the cork and plastic insulation manufacturing and contracting firm. Swift, director and vice-president of the parent company will continue in those executive capacities. He had been manager of the division since 1920.

Don D. W. Lambert, Jr., was appointed as Swift's successor. Lambert had been manager of the Albany, N.Y. branch. He will continue to act as Albany Manager, being assisted by Edward O'Connor of Schenectady.

New Barrett Supplier

▶▶EASTERN SUPPLY CO. has been appointed Barrett Brand Anhydrous Ammonia sales agent in Mount Vernon, N.Y., for the Nitrogen Division, Allied Chemical Corp.

Bower Appoints LaCerra

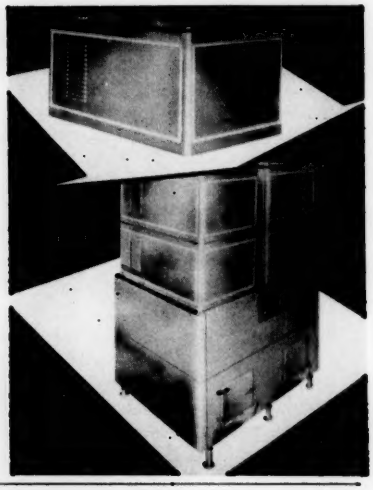
▶▶JOSEPH W. LaCERRA has been named laboratory supervisor at Henry Bower Chemical Manufacturing Co., Phila. He was formerly with Foster D. Snell. The Bower firm manufactures anhydrous ammonia and calcium chloride for use in the refrigerating industry.

Another Patent for Recold

▶▶EARLY in the second quarter 1958, Recold Corp. announced that a patent had been issued to Dan D. Wile, the firm's vice-president and chief engineer, for the unique corner construction design now found on four major classifications of the firm's manufactured products. The patented construction is said to provide unequaled accessibility—being quickly disassembled and as easily reassembled using only a screwdriver. Adding to the appearance, the construction assures a water and air tight seal, and housing fasteners are said to remain free of rust.

Correction to July Issue

▶▶▶UNDER the heading "Another Ice Cuber Marketed" Industrial Refrigeration erroneously reported in the July issue that the unit was capable of producing 400 tons of ice cubes per day! Of course, the tons should have been pounds. To give the reader a better idea of what the unit looks like, and how multiples of the unit can be arranged, see the illustration below.



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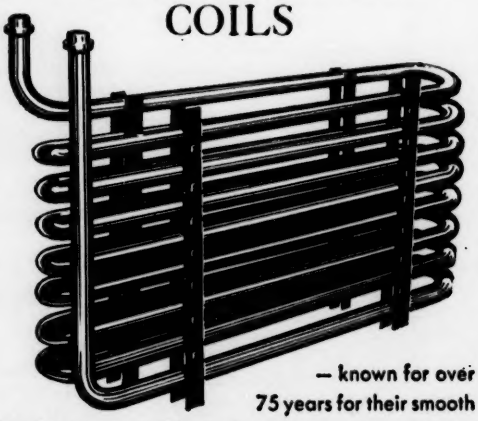

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October 26 to 29, 1958
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Chairman: William M. Walsh

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November 18-21, 1958
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ASHAE-ASRE Merger

▶▶▶ ANNOUNCING approval in principle by Councils of the two societies of a method for merging the American Society of Heating and Air Conditioning Engineers and the American Society of Refrigerating Engineers, Presidents of both groups indicated that the ballotting by the membership of both societies would take place on December 1, 1958, at the 55th Semi-Annual Meeting of ASRE in New Orleans, while the ASHAE will hold a special meeting.

Richmond Plant Rebuilds

▶▶▶ DAMAGED by an explosion in January this year (see INDUSTRIAL REFRIGERATION, March), the Merchants Ice & Cold Storage Co. Warehouse at 200 S. Sixth St. Richmond, will be rebuilt at a cost in excess of $126,000. William J. Rylee of Atlanta, president of the Atlantic Company, which firm owns the Richmond Merchants installation, indicated that construction would probably be complete by Spring 1959. Cause of disaster is crux of litigation.

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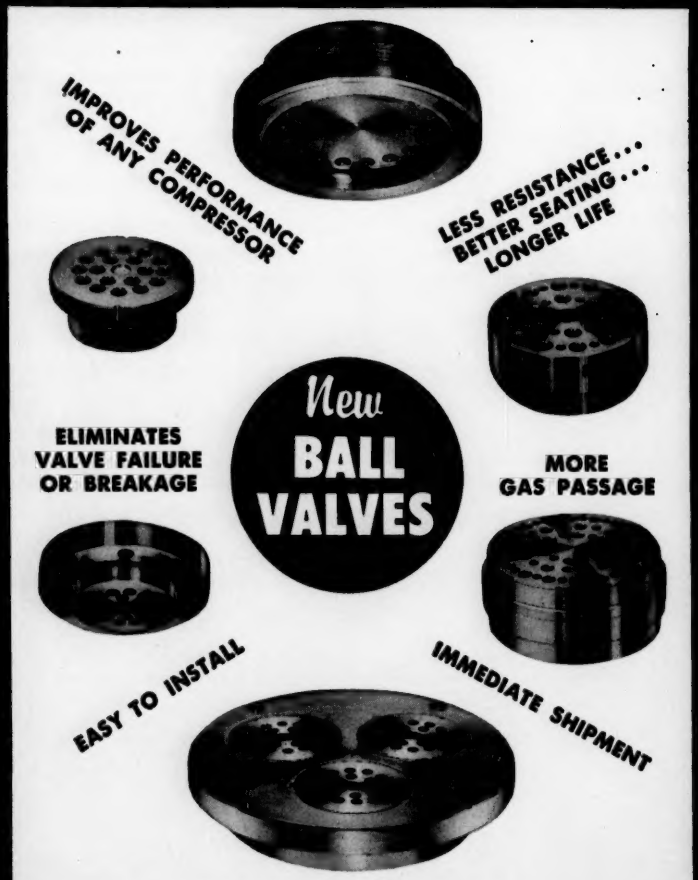

For information on improving the performance of your compressor, send us the name, bore, stroke, speed and serial number of your machine.

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Half Million Gallon Juice Storage Plant

▶▶▶ CONSTRUCTION is progressing rapidly on an addition to the National Dairy Corp. plant at Prosser, Washington. Objectives is to finsh a half-million gallon juice concentrate storage in time to care for this year's processing.

The addition is primarily a cold storage building which will house juice storage tanks. The new capacity is intended to be adequate for a year's supply of processed grape and currant juices. Juice output of the plant goes to manufacturers of frozen grape juice concentrate, as well as to Western jelly and preserve manufacturers.

The new building is 55 x 125 feet in area, and is of concrete construction. Completion of the addition will increase efficiency of the plant as well as the expansion objectives. The plant provides juicing operations for a wide variety of fruits and berries produced in the orchards and vineyards of the Pacific Northwest.

New Columbus Storage

▶▶▶ MURRAY CITY Coal & Ice Company has just completed 170,000 cu. ft. of freezer storage space at their Columbus, Ohio establishment. The construction is single story with rail and truck facilities.

Fruit Industries Research Plan Two Cold Storages

▶▶▶ TWO COLD STORAGE projects were awarded in June by Fruit Industries Research, Yakima, Washington. Construction contract in excess of $88,000 was awarded for a Smith and Nelson, Inc. cold storage building at Tonasket. Construction of a cold storage and packing room at the Omak Fruit Growers, Omak Washington also was announced by FIR, owner of the Tonasket and Omak operations.

Packer's Cold Storage Builds At Fullerton

▶▶▶ CONSTRUCTION permits were issued in excess of $100,000 for construction of a 150 x 300 ft building for Packer's Cold Storage Company, Fullerton, California. The one-story building will be located on Walnut Avenue, adjacent to the Santa-Fe Railroad tracks which will serve the building. This is the third building and second storage for Packer's all within five blocks. The main plant is in Anaheim.

Western Refrigeration Co. Expands Utah Division

▶▶▶ EXPANSION of the cold storage warehouse facilities of Utah Ice and Storage Company was announced early in June by N. F. Hecker, Salt Lake City manager. The firm which was acquired earlier in the year by Southwestern Public Service Co., NYC, will have 17,500 sq. ft. of freezer storage area added. Estimated cost is $200,000.

Operating as a Division of Western Refrigeration Co., a totally owned subsidiary of the NYC firm, the added facility will bring refrigerated space in Salt Lake City to 9 million pounds. The addition will hold approximately 3½ to 4 million pounds of food stuffs to temperatures as low as minus 30 F. Utah Ice and Storage operates four million pound storages in Provo and Ogden, also.

Dock-To-Truck Seal Canadian Addition Feature

▶▶▶ CANADIAN Dress Meats Ltd. is constructing a fourth addition to its packing house in Toronto. Unique feature is an air tight seal between the docks and the loading doors of the trucks. Objective is to prevent sweating of meat carcasses and quality impairment during transportation.

The new construction consists of a beef sales cooler with a capacity for 300 carcasses, and the 2,000 sq. ft. loading dock. The seal feature enables the meat to remain in refrigerated air at all times.

Ammonia Fumes Overcome Michigan Family

▶▶▶ PRESS wire services reported late in June an incident where a young couple and their two infant sons were overcome by ammonia fumes in Hastings, Michigan. A transfer line between a tank car and plant storage tank burst. Evaporation of the liquid ammonia which escaped is said to have caused a dense fog over an 8-square block area. The report did not give the proximity of the family to the derangement nor did it indicate whether the ammonia was agricultural, commercial or refrigerant type although the effect would have been the same. The family was hospitalized but their condition was reported good.

Private Warehouse Completed in Plymouth

▶▶▶ PLYMOUTH Cold Storage of Plymouth, Wisconsin, has completed construction of a new cold storage facility. With the capacity of 6 million pounds of cheese, the building was erected in three months at a cost of $75,000. The Plymouth Cold Storage Company is reported to be a Division of the Borden Co.

Revolutionary construction was utilized, according to H. J. Goelzer, Plymouth's Vice President. A prefabricated butler type frame was erected and foam glass was used as a wall and roof enclosures. Aluminum was applied over the insulation as a rough finish. No interior finish was used. Bassett Refrigeration Company of Appleton and Green Bay provided the refrigerating equipment. Cost of this equipment in addition to the building construction was not disclosed.

Kraft Foods Company Adds To Buffalo Plant

▶▶▶ ESTIMATED at $50,000, a 5000-sq. ft. addition is to be constructed at the Kraft Foods, Buffalo, New York, Sales and Distribution Branch. The one story addition will be used for cold storage purposes and truck loading dock. Kraft Foods is a Div. of National Dairy Products, Inc.

Ammonia Leaks

▶▶▶ RELEASED late in June by the Warehouse Operations Committee, NARW, is a two-page Instruction Bulletin on Ammonia Leaks. Written by Paul B. Christensen of Portland, Maine, chairman of the Construction, Maintenance and Repair Div. of the Refrigerated Warehousemen's standing committee, the bulletin outlines in general the procedure to be followed when a refrigerant break occurs.

Points covered include the securing of the refrigerating plant or that section which is damaged, and the evacuation of personnel and product from the area. Then follows instructions on how to neutralize the ammonia fumes and ventilate the area. The bulletin even contains a reminder to contact customers whose produce may have been involved. Three references on the handling of refrigerants and disaster procedures are given.

Strathmore Grape Contracts Pre-Cooler

▶▶▶ CONSTRUCTION of a precooling plant for the Strathmore Grape Growers Association at G Street and S.P. tracks has been permitted by Strathmore, California officials. The structure will cost approximately $27,500.00.

There's a Place in Your Planning For Kohlenberger Engineering

Kohlenberger's extensive manufacturing facilities and experienced staff make it possible to offer industry a *complete* service in the development and installation of heavy duty industrial refrigeration and air conditioning equipment.

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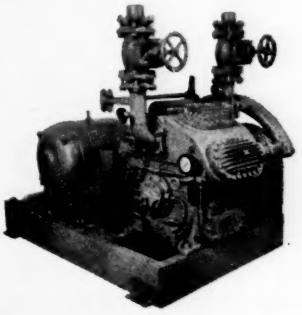

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All refrigerating engineers are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

From the President's Desk

Executive Reviews Significance Of the Association's Motto

Frank L. Chase

▶▶▶ FIVE YEARS AGO the editorial in the NAPRE OPERATING DATA BOOK dealt with the NAPRE Motto. The Editor, at the suggestion of NAPRE's Board of Directors, placed emphasis on a phase of the educational program which is often neglected.

Perhaps the reason for indifference on the part of NAPRE chapters toward instruction of their members with regard to the Association's Motto, lies in the fact that there are many other character building groups with which men can become affiliated. However, it can be readily seen from attitudes of what we hope are a minority of business, professional, labor and political characters that there is room for improvement nationally in our attitude as to what is moral.

Three-Word Slogan

Morality, Economy and Competency has been the Motto of NAPRE for over 48 years. NAPRE's educational program is an actual tool by which its members derive a good portion of their material success, but the real backbone of achievement is sound character.

Emphasizes Integrity

The term Morality used in NAPRE has the same meaning as integrity. Good NAPRE members have a high sense of decency, honesty, high principles and good character.

Self-Training In Economy

Economy, the second word of the Association Motto, is a little more difficult to define. Perhaps it could best be called thrift. It works two ways. To waste not the Boss's goods in such items as fuel, power, water, etc., repays the individual also in additional self training. It develops far-sight, self-denial and determination to hold to purposes. To learn how to handle first things first, will make a person just as successful as thrift will make him prosperous.

Practical Know-How

Competency in the NAPRE Motto means exactly what it says. It is professional competence. In addition to a thorough mastery of each duty and the effective performance of appropriate work, it carries the added meaning that the member should be industrious and desirous of rendering service. Hard work, diligence, perserverance go hand-in-hand with this third section of the Motto.

During August, presidents of chapters will call their executives together for the purpose of outlining Fall and Winter educational programs. Using the few suggestions given here, perhaps the chapter program chairman could schedule or arrange a panel of old timers from within the chapter who can point out some very practical examples of how the Motto has worked for them. New members in each of the chapters would thereby derive a greater appreciation for this unseen educational advantage of their membership.

Safety in the Engine Room

Summer Edition of the Chapter Bulletin by our Association's Publications Committee has repeated in detail one of the recent Safety Committee Bulletins by the National Association of Refrigerated Warehousemen. As James L. McIlrath, NAPRE's Industry Relation Chairman notes, these points are well worth the attention of NAPRE members. It is an excellent idea to feature a Safety Program for one of your chapter's Fall meetings.

"The engine room is the heart of your plant and is a place that can be very hazardous unless proper planning and inspection are carried through. Following is a list of things to be done every month.

Test all relief and safety valves.
Test all protective devices.
Be sure protective guards are in place.
Check gas masks and canisters.
Check emergency light circuits."

The foregoing serves as an excellent Safety Program outline.

Frank L. Chase

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News Notes and Chapter Activities

Richard Quam, center, President, Spokane Chapter, addresses a few remarks to the charter gathering. At right, George Paulick, National Deputy, stands by to conclude the ceremonies, while chapter Secretary, Wyman Erickson, seated, records the events. At right, the newly installed officers pose for a group photograph. Left to right: George Orman, Chester Echalbarger, August Mansfield, Clifford Clapp, and Wyman Erickson.

Charter Presentation Gives Washington Fifth Chapter

SPOKANE – Charter presentation to Spokane Chapter, NAPRE, took place May 19, 1958 at the Silver Room in the Spokane Hotel. George Paulick of Los Angeles, Calif., National Sergeant-at-Arms, officiated. Paulick also initiated the Spokane NAPRE officers and members. Officers installed were: President, Richard Quam, Chief Engineer, Sick's Spokane Brewery; 1st Vice-President, Clifford Clapp, Lead Engineer, Carstens Div.–Hygrade Food; 2nd Vice-President, August Mansfield, Asst. Ch. Eng., Sacred Heart Hospital; Secretary-Treasurer, Wyman Erickson, and Asst. Secretary-Treasuret, George Orman, both engineers for Sick's Spokane Brewery; Sergeant-at-Arms, Chester Echalbarger, Eng., Inland Empire Dairy.

Paulick reviewed educational purpose and function of NAPRE. He presented the charter to Spokane President Richard Quam who also gave a short speech of acceptance and thanks. He indicated that Spokane enjoyed having Paulick with them as the National President's representative for the official ceremony.

A social hour and dinner for members and their wives preceded the charter presentation, and after the ceremony those present enjoyed an evening of dancing at the hotel. The charter presentation was a culmination of work on the part of many people. M. E. Bell, formerly of Seattle, Chairman, NAPRE Board of Directors, was instrumental in the organization of the Spokane group. He was assisted by Bill McCorkle, Bob Harrison, and Howard Penor of Seattle, and by Howard Peterson and Elmer Toop of Yakima.–WYMAN ERICKSON.

Views at the South-Central Educational Conference

Camerman Frank Goulding snaps conference visitors at Swift & Co.'s Jackson engine room; Nat'l Sec'y, Jackson Educ'l Chairman, and speaker Forest North on Nat'l Bank B'ld'g roof; lady visitors at Swift's with President Chase; head table at concluding dinner; corner of chapter clinic luncheon table—President Chase with J. R. Thompson, Jackson Sec'y, facing camera.

Mississippi Presents Program of Wide Variety

JACKSON–Water vapor absorption refrigeration systems, heat pump applications, re-circulating systems, codes, changing refrigerants, and apprenticeship programs have all received equal billing on the dual programs presented by Mississippi chapter. The talk on the absorption system was actually a playback of a recording made during the Spring Regional Educational Conference held in Jackson. Members of the chapter were quite busy playing host and were unable to take in the presentation at that time.

The talk was given by Forest North, a consulting engineer. The application was in the First National Bank Building of Jackson. It consisted of two 450 TR units. North told of the problems confronting consultants, owners and contractors in planning and installing the system, and cited the reasons which warranted the installation of the low pressure absorption system over the mechanical compression type. The difference in actual operating costs and those estimated, including comparison of estimated mechanical refrigeration costs, is not as great as it appeared.

Presentation on heat pumps was by a Mr. Dixon of Mississippi Power & Light. Using colored slides to make interesting points in the presentation, Mr. Dixon pointed out some of the advantages to be gained by using all electrical facilities; that is, heating by electricity, as well as cooling by electrically driven mechanical refrigeration.

Rapid Ice Installations

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FULLY COVERED BY WORLD PATENTS

Ice blocks of standard size, 56 to 340 lb., produced in 1½ – 2½ hours freezing time. No brine—no corrosion—no crane—no tank—no agitators—no thawing tanks. Negligible thawing loss. Exceptional melt resistance. Higher profits achieved. Simplified clear-ice production. Large sea-water ice blocks, without salt segregation for fisheries. Easily dismantled and maintained. Portable—very little space required. Considerable saving of power. Over 110 installations now are working to entire satisfaction. Rapid freezing process for the chemical industry. Plants of 1 – 500 tons capacity can be supplied with short deliveries.

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The talk on liquid recirculating was by R. B. Bass of J. E. Watkins Co. He described a Cycle Center which his company had developed for providing constant liquid pressure in a system, and the return of liquid to the feed devices in the system without benefit of re-compression or return to a high pressure receiver.

Civic Interests Also

Another educational speaker was Bill Marshall of Penn Controls who gave a very interesting slide presentation on different types of refrigerants, temperature and motor controls. Another speaker was the chapter's own Ray Benton who discussed the important facts to consider when treating condensing water cooled by means of a tower. On that particular program two other short features included a movie on electrical circuit faults and a slide presentation on changing refrigerants. The latter educational film was produced by the General Chemical Div., Allied Chemical Corp.

Thomas P. Stevens, State Supervisor, U. S. Department of Labor, Bureau of Apprenticeship and Training had appeared before the Regional Educational Conference on a chapter forum. Members of the chapter have followed up on Steven's suggestion that they form a committee to determine the need of any form of apprenticeship program in the Jackson area. Member Scruggs agreed to be temporary chairman of such a committee which will contact business people in the area to see if such interest would warrent the opening of a school and determine what topics would be most useful to the community. Members Mumford and Simmons continued cooperative work with Jackson City Council toward the adoption of a refrigeration and air conditioning safety code. The chapter continues to meet at the Heidelberg Hotel on the 1st and 3rd Tuesdays.—R. H. STEWART.

Aircraft Compressors Washington No. 1 Feature

▶▶ SEATTLE—Preparations to be host at a Northwest Regional Educational Conference does not deter Washington No. 1 Chapter from carrying on its regular programs. Perhaps one of the most unique meetings of the year was the one held on April 17 which featured a discussion of aircraft refrigeration compressors. Two speakers shared the platform. The business portion of the program was terminated and in lieu of an instruction period, the meeting was turned over to the guest speakers for the evening.

Chet Heath of Hamilton Standard, a division of United Aircraft Corporation, was the first speaker. Heath is a resident engineer for Hamilton at the Boeing Airplane Company in Seattle. After a short introduction and resume of the compressor and driver that Hamilton supplies to Boeing for use in the 707, Heath introduced Clint Sloan of the equipment staff of Boeing Airplane Company. Sloan showed pictures and drawings of the

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For temperatures minus 60° F. to 40° F.

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Designed for use with air blast ranging from 600 FPM to 1200 FPM depending on product requirements.

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Hamilton compressor and others similar. He discussed the relative merits of the "vapor" and "air cycle" types of air conditioning as they apply to present and future aircraft, primarily transports.

Forty-pound—10 TR Units

The Hamilton Standard compressor, being evaluated for use in the Boeing 707 is of a 10-ton capacity; it is roughly the size of a bowling ball and weighs 40 pounds. Two will be required per aeroplane. Normal evaporator pressure is 14 psia at 38 F, condensing temp. 140-160 F at 85 psig; Refrigerant 114 for each system is 20 pounds and 1 pint of oil for lubrication. The compressor while quite small is two stage and the motor is a 2-pole synchronous at 24000 rpm and 208-volt, 400-cycle power.

Heath and Sloan pointed out that because of the small tube size and high velocities this unit is not economical, requiring almost 3 horsepower per ton of refrigeration. Power may be supplied to the compressors and other electrical aeroplane components by 40 Kva alternators on each engine of the Boeing 707. These alternators are no larger than two 10-lb. lard buckets but supply 208-volt, 400 cycle, with a regulation of ½ of 1 percent.

Sloan gave a history of some of the air conditioning units currently in use in aircraft. He pointed out that the compressor currently in use by several passenger-transport planes as well as the Boeing Stratocruiser is a modified "Carrier" 5-ton reciprocating compressor weighing 90 pounds, compared to the Hamilton 10-ton at 40 pounds and much reduction in size. After a rather lengthy question and answer period the meeting was adjourned with a vote of thanks to the speakers.

Carnation Inspection Trip

An event which was indirectly an outgrowth of the preparations for the educational conference held on June 7 was an earlier field trip through the Carnation Co. plant in Seattle. Planning and preparing for a regional conference brought the officers of the three Puget Sound chapters together quite frequently. These members and their families, therefore, took advantage of one such gathering, to tour the milk processing and ice cream manufacturing establishment. The tour was conducted by Howard Bennett, Carnation's chief engineer at Seattle.

Many points of interest included new and improved freezing processes, product handling and storage, cleaned-in-place piping and equipment, to mention a few. The plant itself had previously been described in INDUSTRIAL REFRIGERATION in 1957. Of course, the main points of interest for all the small fry were the many and varied kinds of frozen and bottled goods. To climax the tour for all, and especially for the youngsters, coffee, milk, cookies and ice cream were served in the Social Room at the conclusion of the tour.—BILL MCCORKLE.

Louisiana NAPRE Features Out-of-Town Speakers

▶▶ NEW ORLEANS — Besides concerning itself with support of the South Central Regional Educational Conference, NAPRE, and encouraging the growth of new chapters like at Jackson, Miss. and Birmingham, Ala., Louisiana Chapter No. 2 has featured speakers from other localities for its Spring sessions. Typical of the speakers presented has been R. B. Bass, Sales Manager, J. E. Watkins Co., Maywood, Ill. Bass was a guest speaker at the March 9 meeting which was held at the Roosevelt Hotel in New Orleans. His presentation was a paper published in two parts in the May and June issues of INDUSTRIAL REFRIGERATION entitled, "Automatic Defrost Systems".

In addition to the defrosting presentation, Bass introduced some thoughts concerning recent designs of industrial refrigeration equipment which makes old plants new and new plants better. He pointed out that the plant engineer today still fulfills his function of nearly 50 years ago when NAPRE was founded, rendering his obligations to the employer in the way of economic and efficient operation. He described developments in recycling of liquid in refrigeration systems by means of compressor discharge gas application. In his illustrations, he pointed out that one objective of efficient operating was to keep head pressures down. An illustration used, indicated that a reduction of two to four pounds of head pressure is equivalent to one percent reduction in power.

Air Coil Design and Blast Freezer Techniques

The speaker also covered some improved blast freezer equipment. He suggested that fans be arranged to pull air through a coil rather than push it. As a result, Bass pointed out, better air distribution through the coils was achieved.

Also, in blast freezing, it is most important that the air be as cold as possible in order to reduce shrinkage of the product. Although increased power may be required to super cool the air, this additional power cost will be more than offset by savings through minimizing of product shrinkage and enhancing of product quality.—WALTER MERWIN

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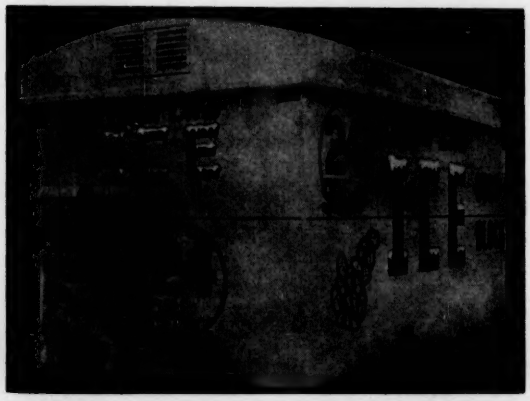
- **These new vendors are now made in lengths up to 20' which will vend 268 10# bags plus 132-25# blocks out of the same delivery door, (400 Sales).**
- **Up to 5 various sizes of blocks or bags can be vended from this one vendor.**
- **Radical invention, trouble free, more storage space by design, lower operational cost.**

NEW LOW COST 6' x 8' station vends 110-10# packages, or the "Junior", 3' x 7' station vends 90-10# packages using the new multi screw vendor.

ILLUSTRATED
9' x 16' Station vends 168-10# bags and 86-25# block.



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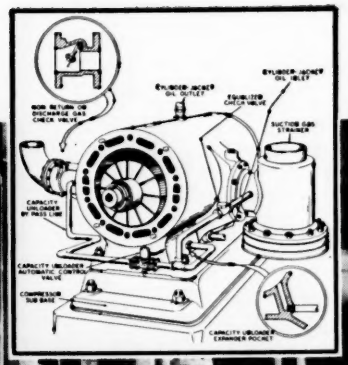

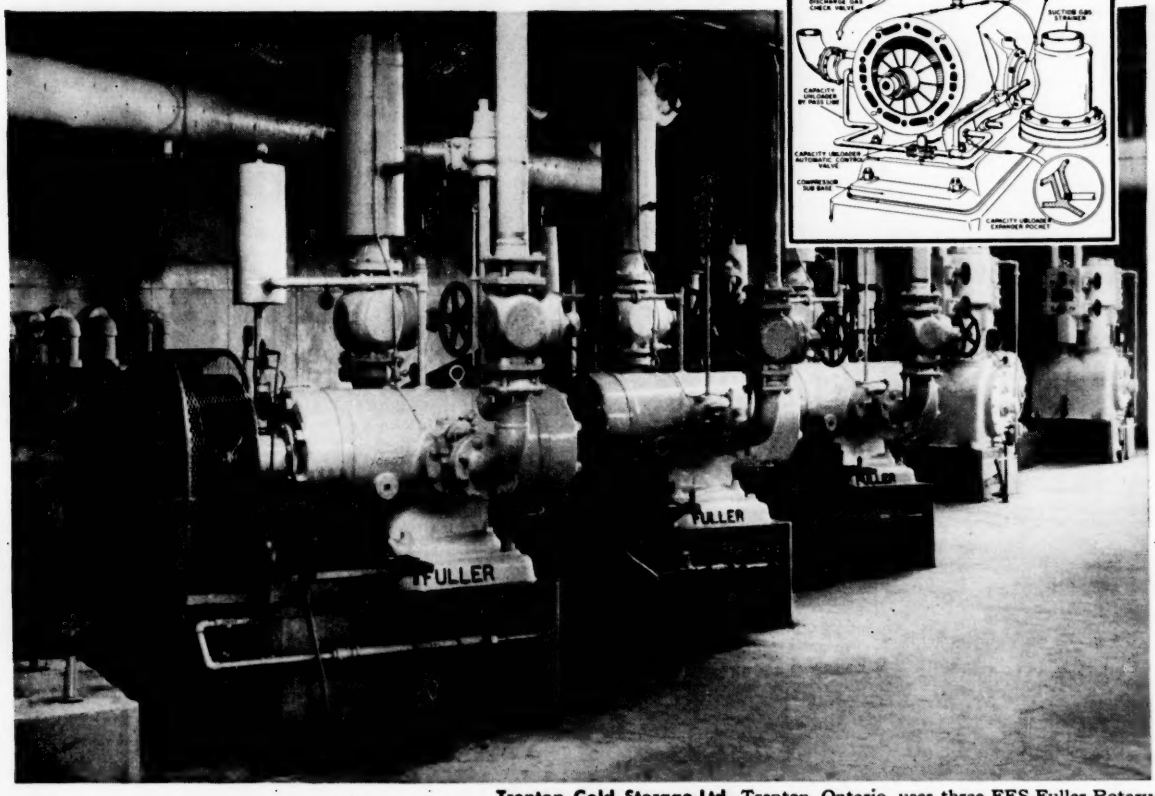

Trenton Cold Storage Ltd. Trenton, Ontario, uses three FES-Fuller Rotary Booster Compressors, rated at 244 tons, to maintain an even temperature of –40°F. *Installed by John Inglis Co., Limited, Toronto, Canada.*

TRENTON DROPS POWER COSTS 20% with New FES-FULLER booster installation!

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Wisconsin Fetes Alberte

▶▶ MILWAUKEE—Members of Green Bay, Chicago and Milwaukee, NAPRE, bid farewell to John Alberte, past president of the Milwaukee Chapter at a dinner in his honor on Friday, June 13. Alberte is being transferred by his employer, the Joseph Schlitz Brewing Co., to Tampa, Fla., where he will be chief operating engineer. He had been engineer in charge of refrigeration and air conditioning at the Milwaukee plant.

Acknowledging the service which Alberte had rendered the chapter as president, Leland J. Anderson, chapter president, pointed out that Alberte had not only served the new chapter as its second chief executive but had filled the various roles as chapter instructor, co-chairman of regional picnic meetings for the three chapters, and had been host to the regional educational conference held in Milwaukee last year.

Heading the Green Bay chapter delegation for the testimonial dinner was Harvey Wishart, president of the Northern Wisconsin group. Chicago chapter was represented by second vice-president, Ben Garzynski. National officers were represented by the national secretary, J. Richard Kelahan, and national director Eugene Rytlewski. Two Australian visitors were Bill North and Clive Boote. North and Boote were touring the United States and they fortunately timed their visit to the Milwaukee group for this event.

The affair was held in the Spanish Gardens and those in attendance enjoyed dancing following the hot buffet dinner. Typical Milwaukee refreshments preceded the meal and followed during the dancing period.

Chapter Loses Member Godfrey Passes On

Along with the good news of member promotions, transfers, etc., comes the bad news of the loss of a very good member. Joseph S. Godfrey died of a heart ailment in Mt. Sinai hospital in mid-May. A charter member of the chapter, he was the operating engineer for National Ice and Coal Co. In addition to his wife he is survived by 2 sons and a step-son, 3 daughters and a step-daughter. He was a member of NAPE, IUOE and the American Diabetes Association.

—PAUL HENNING.

Industrial NAPRE Member Addresses Mountain Group

▶▶ DENVER—Highlight of the Spring speaker presentations at NAPRE's Denver Chapter was a talk by Industrial Member Wm. V. Richards, chief engineer, H. A. Phillips Co., Chicago. On this occasion the chapter met for a dinner meeting in the Albany Hotel Green Room. Using slides and blackboard illustrations to demonstrate applications and theory behind product, Richards lectured on liquid return systems for compressor protection.

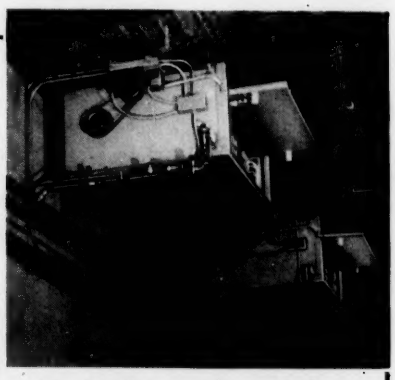
Although all members in attendance expressed a keen appreciation for what the systems would do in their own plant, most interested appeared to be the refrigeration contractors who kept the technical question and answer session going for some time. Denver members were pleased also to have Bill and Marge Richards spend a few additional days with them to enjoy some of the late skiing season.

Another speaker who captured the fancy of Denver members was Wm. A. Prenienger, Mueller Brass Co., Denver. Prenienger gave a talk on driers, fittings, tubing, forged valves and component parts. Cutaway models and slides were displayed, a movie was shown and a question and answer session followed.

Free Magazines Offered

Perhaps one of the speakers most appreciated of the Spring group was L. A. Spero, maintenance specialist from the Denver plant of General Electric Co. Spero made his talk to the chapter on the subject of electric motor maintenance. The feature which made the members sit up and take interest most was his offer of a magazine to each member, for free. Productive Maintenance Service Record, a magazine of ideas and information for the engineer, was the publication offered. It is published quarterly and each member in attendance at the meeting now receives this valuable outside house organ from Spero's employer.

—FRANK DIDONATO.



Partial view of six Krack coolers installed by York Louisville Co.

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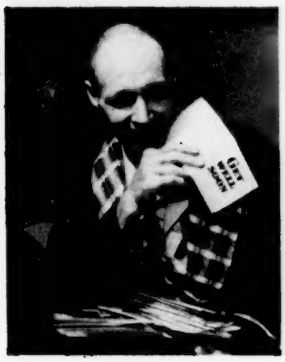
Tennessee Chapter Hero Making Rapid Recovery

MEMPHIS—Emerson Boland, member of Tennessee Chapter No. 1 who was critically burned in an explosion and fire at Ellis Auditorium early in the year was recently discharged from the Baptist Hospital. Memphians contributed more than $3,000.00 to a fund set up for the engineer in a trust at the National Bank of Commerce. Boland beat out the flames that followed a blast during an opening night of the Junior League Follies, then dragged himself to a telephone to report the catastrophe. As a result of his efforts, the audience was evacuated from the auditorium in a very orderly fashion, many of them not realizing that an explosion and the fire had taken place. Boland continues to receive congratulatory messages at his home and the contributions to the trust go to offset medical expenses.

Joint Refrigerating Meeting

In April an unusual arrangement of an educational meeting took place between ASRE, RSES and NAPRE chapters in Memphis. Tennessee Chapter No. 1 had extended an invitation to the other two local groups. George Ramsey, Chairman of ASRE and A. G. Brainerd, president of RSES Chapter headed up delegations who accepted the NAPRE invitation. The speaker was R. B. Bass, J. E. Watkins Co., Maywood, Ill. Bass's topic has been published in the May and June issues of IR.



E. S. Boland

A visitor to the May meeting of the chapter was C. Tom Baker, a member of NAPRE's National Educational Committee. Baker has stopped off at Memphis to visit with two past presidents, C. A. Conley and Alvis J. Clay, on his way to Granada, Miss.

Spring meetings of Tennessee Chapter with few exceptions have been given over to continued instruction in basic refrigeration. H. L. Todd, chapter instructor, covered the chapters on brine refrigerating, eutectic applications, and humidities. Subsequent chapters covered included various complete systems for milk processing, ice cream manufacturing, sea food freezing and preserving and air conditioning.—CHARLES CONLEY.

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Bower Chemical Mfg. Co., Henry 32
Brown Mfg. Co., Inc., K. G. 40
Butcher Boy Refrigeration Door Co. 1

Chicago Nipple Mfg. Co. 40
Classified Alvertising 43
Conveyor Co., The 33

Dow Chemical Co., The .... 22 and 23
Dunham-Bush, Inc. .... Inside Front Cover

Freezing Equipment Sales Inc. 41

General Chemical Div.,
Allied Chemical Corp. 8
Gifford-Wood Co. 28
Greene Associates, Van R. H. 43

Hubbell Corp. 39

Jamison Cold Storage Door Co. .. Back Cover

King Co. of Owatonna, The 27
King-Zeero Co. 33
Kohlenberger Engineering Corp. 35

National Pipe Bending Co. 32
Niagara Blower Co. 31
Nickerson & Collins Co. 39

Ohio Galvanizing & Mfg. Co., The 39

Perfection Ice Scoring Machine Co., The .. 42

Rapid-Ice-Freezing Ltd. 38
Recold Corp. 2
Refrigeration Appliances, Inc. 42
Rempe Co. 39

Sporlan Valve Co. 37
Swift & Co. 44

United Cork Companies 29

Vogt Machine Co., Henry .. Inside Back Cover

Wanted and For Sale Advertising 43

York Corp. 25

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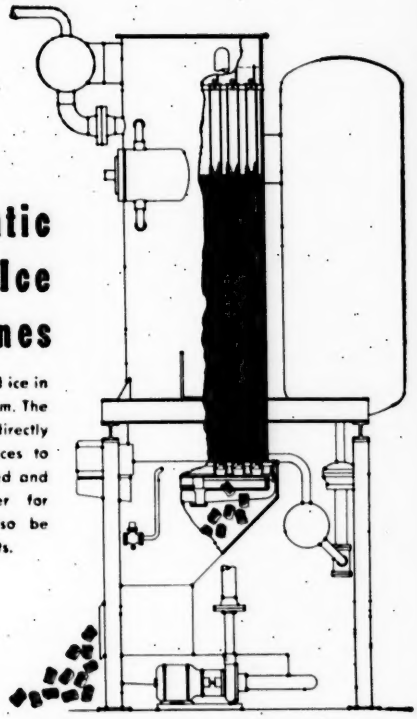

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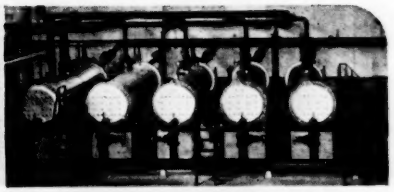

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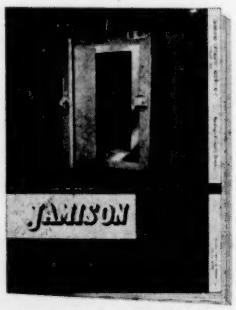

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